

Author; tshingombe
Curriculum assessment

Title:

Career Application Trade Education Orientation Guide: Actuary and Method Research Library Join Info Technology

Author: Tshingombe Tshitadi

Overview & Scope

This guide presents a comprehensive system for navigating career pathways in trade education, actuarial science, and information technology. It integrates:

- **Orientation frameworks** for learners, educators, and professionals
- **Modular logigram/algorithm logic** for automation and traceability
- **Research methodology** linked to bibliographic systems
- **Regulatory frameworks** for auditing, compliance, and career rehabilitation

Key Description

- **Career application logic:** Maps trade education to actuarial pathways using modular decision trees.
- **Visual Basic logigram/algorithm:** Automates inventory, assessment, and regulatory workflows.
- **Information systems:** Link library research, data analysis, and skill development into credential-linked dashboards.

Background Review

- Based on frameworks from **SAADP, Actuarial Society of South Africa, and QCTO**
- Integrates **career guidance, actuarial science, and trade education** into a unified orientation model.
- Applies **modular programming** and **binary logic** to automate assessment and reporting.

Management System Information & Framework Regulator

- **System modules** include:
 - Career orientation
 - Trade education mapping

- Actuarial method research
 - Library integration
 - Visual Basic automation
- **Regulatory alignment** with POPIA, CCMA, SETA, and PSIRA frameworks.

Incident & Collision Report Logic

- Tracks:
 - Career misalignment
 - Educational dropout
 - Regulatory non-compliance
- Uses binary-coded statements and logigram logic to resolve and redirect career pathways.

Data Analysis: Advantage & Disadvantage

Dimension	Advantage	Disadvantage
Trade Education	Practical, skill-based, industry-aligned	May lack theoretical depth
Actuarial Path	High earning potential, analytical rigor	Requires strong math foundation
Visual Basic	Automates tasks, traceable logic	Requires programming literacy
Library Research	Deep referencing, academic credibility	Time-intensive, access-dependent

Statement Delivery & Auditing

- **Statement modules** include:
 - Career declaration
 - Educational alignment
 - Regulatory compliance
- **Auditing logic** uses Visual Basic to track:
 - Skill development
 - Portfolio evidence
 - Regulatory milestones

Skill Development & Inventory Logic

















- Tracks:
 - Unit standards
 - Internship records
 - Employment history
- Uses algorigram logic to map:
 - Assessment scores
 - Portfolio status
 - Regulatory readiness






Reference Bibliographie

- SAADP Career Guide Booklet

Actuarial Society of South Africa: Becoming an Actuary

Table of Contents















Copilot said	Error! Bookmark not defined.
 Section 1: Personal Details	12
 Section 2: Responsible Business Task	12
 Step 1: Promotional Article.....	12
 Step 2: Risk Assessment	12
 Step 3: Briefing Document	13
 Section 3: Reflective Diary	13
 Facilities Task.....	13
 Health & Safety Incidents	13
 Health & Safety Statistics (2020/2021)	13
 Facilities Reflective Diary.....	14
 Marketing Task.....	14
 Customer Persona	14
 TikTok Marketing Idea	14
 Marketing Reflective Diary.....	14
 IT Business Analyst Task	14
Copilot said	15
 IT Business Analyst Task	15
Section 1: Personal Details	15
Section 2: Business Analysis Case Study.....	15
Section 3: Stakeholders.....	15
Section 4: Gaps.....	16






















Section 5: Website Design Factors.....	16
Section 6: Reflective Diary	16
 Marketing Task.....	17
Section 1: Personal Details	17
Section 2: Customer Persona	17
Section 3: TikTok Marketing Idea	17
Reflective Diary	17
Copilot said	18
<input type="checkbox"/> Visual Basic Code: Responsible Business Task Automation	18
<input type="checkbox"/> Optional: UserForm Design (SQAForm).....	19
Copilot said	20
<input type="checkbox"/> Visual Basic Code: IT Business Analyst Task Automation.....	20
<input type="checkbox"/> Optional: UserForm Design (BusinessAnalystForm)	21
You said	21
Copilot said	22
<input type="checkbox"/> Visual Basic Code: SQA Course Tracker & Assessment Logger	22
<input type="checkbox"/> Optional: UserForm Design (CourseTrackerForm).....	23
Copilot said	24
<input type="checkbox"/> Visual Basic Code: Engineering Science Logigramme & Project Tracker	24
<input type="checkbox"/> What This Module Supports.....	26
Copilot said	26
<input type="checkbox"/> Overview: AH Engineering Science 2025	26
 Scoped Description by Section	27
◆ Section 1 — 35 Marks (Attempt ALL)	27
◆ Section 2 — 40 Marks (Attempt ALL)	27
 Key Operational Notes	27
 Logigramme Mapping (for Q1(a)).....	27
You said	28
Copilot said	28
<input type="checkbox"/> Overview: AH Engineering Science 2025	28
 Scoped Description by Section	29
◆ Section 1 — 35 Marks	29

◆ Section 2 — 40 Marks	29
🔑 Key Operational Notes	29
🔗 Logigramme Mapping (Q1(a) Example).....	29
Copilot said	30
□ Overview: Electrical Engineering Principles (SCQF Level 7)	30
📁 Scoped Description by Outcome	30
◆ Outcome 1: DC Principles	30
◆ Outcome 2: Single-Phase AC Principles.....	31
◆ Outcome 3: Three-Phase Principles.....	31
◆ Outcome 4: Electrostatics & Electromagnetics	31
🔗 Modular Knowledge & Skills Mapping	31
□ Visual Basic Code: Modular Assessment Tracker	31
🔧 Use Cases.....	32
Copilot said	33
□ Overview: Electrical Engineering Principles (SCQF Level 7)	33
📁 Modular Description by Outcome	33
◆ Outcome 1: DC Principles	33
◆ Outcome 2: Single-Phase AC Principles.....	33
◆ Outcome 3: Three-Phase Principles.....	33
◆ Outcome 4: Electrostatics & Electromagnetics	34
□ Visual Basic Code: Modular Outcome Tracker & Logigramme Mapper	34
🔧 Use Cases.....	35
Copilot said	35
□ Overview: SQA Advanced Certificate & Diploma in Electrical Engineering.....	35
📁 Scope: Modular Unit Domains.....	36
◆ Core Domains (Certificate Level).....	36
◆ Advanced Domains (Diploma Level)	36
□ Visual Basic Code: Modular Unit Tracker.....	36
🔧 Use Cases.....	38
□ Overview: Transmission Lines and Complex Waves	38
📁 Scope: Modular Outcome Breakdown	38

◆ Outcome 1: Characteristics of Transmission Lines.....	38
◆ Outcome 2: Matched Termination Performance.....	38
◆ Outcome 3: Various Terminations.....	39
◆ Outcome 4: Network Response to Complex Waves.....	39
□ Visual Basic Code: Outcome Tracker & Parameter Calculator	39
🔧 Use Cases.....	40
Copilot said	40
□ Overview: Engineering Mathematics 5 (SCQF Level 8)	41
📁 Scope: Modular Outcome Breakdown	41
□ Visual Basic Code: Outcome Tracker & Laplace/Eigenvalue Calculator	41
🔧 Use Cases.....	43
Copilot said	43
□ Overview: AH Engineering Science 2025	43
📁 Scope: Modular Breakdown by Section	43
◆ Section 1 — Core Engineering Applications	43
◆ Section 2 — Advanced Systems & Control	44
□ Visual Basic Code: Modular Tracker & Engineering Calculator	44
🔧 Use Cases.....	45
Copilot said	46
□ Overview: Question 10 – Telescopic Boom Arm Crane & Amplifier Circuit	46
📁 Scope: Modular Breakdown	46
□ Visual Basic Code: Nodal Analysis & PWM Calculator	46
🔧 Example Usage	47
Copilot said	48
□ Overview: AH Engineering Science 2024 Marking Instructions.....	48
📁 Scope: Modular Breakdown of Marking Logic.....	48
□ Visual Basic Code: Modular Marking Simulator	49
🔧 Use Cases.....	50
Copilot said	50
□ Overview: AH Engineering Science 2024 – Questions 8 & 9	51
📊 Tableau: Modular Marking Summary	51
□ Visual Basic Code: Engineering Marking Simulator	51

Copilot said	53
□ Overview: National 5 Engineering Science Assignment (Leisure Pool Complex)	53
📁 Scope: Assignment Structure.....	53
📊 Tableau: Task Management Summary.....	53
□ Visual Basic Code: Assignment Tracker & Compliance Logger	54
Copilot said	55
□ Overview: National 5 Engineering Science Assignment (2024–25)	55
📁 Scope: Assignment Task Breakdown	55
📊 Tableau: Task Management Summary.....	56
□ Visual Basic Code: Assignment Tracker & Subsystem Logger.....	56
Copilot said	57
□ Overview: AH Engineering Science 2023 (X823/77/11).....	58
📁 Scope: Section Breakdown	58
◆ Section 1 — Engineering Fundamentals.....	58
◆ Section 2 — Structural Analysis.....	58
📊 Tableau: Task Summary	58
□ Visual Basic Code: Modular Tracker & Engineering Calculator	59
Copilot said	60
□ Overview: AH Engineering Science 2023 (X823/77/11).....	60
📁 Scope: Key Topics by Question.....	61
📊 Tableau: Engineering Data Summary	61
▴ Castellated Beam Ix-x Table	61
✍ Photobioreactor Tube	61
□ Visual Basic Code: Structural & Control Calculators	61
You said	82
Copilot said	82
You said	82
Copilot said	82
□ Career Scope & Job Roles.....	82
□ Psychometric Evaluation.....	82
📈 Career Performance & Recruitment.....	83
□ Experimental Student Record & Assessment.....	83

 DUT Post Roles & Institutional Alignment	83
You said	84
Copilot said	84
<input type="checkbox"/> Psychometric Calculation & Recruitment Goals	84
 Statistical Metrics for Career Analysis	84
 Portfolio Submission & Didactic Value.....	85
<input type="checkbox"/> Job Simulation, Demo, and Real-World Testing	85
⚡ Career Levels, Awards & Awareness.....	85
 Labour Conciliation & Ruling Integration	85
<input type="checkbox"/> Career Scope & Job Roles.....	86
<input type="checkbox"/> Psychometric Evaluation & Recruitment Goals	86
<input type="checkbox"/> Experimental Student Record & Assessment.....	86
 Statistical Metrics for Career Analysis	86
 Portfolio Submission & Didactic Value.....	87
<input type="checkbox"/> Job Simulation, Demo & Real-World Testing.....	87
⚡ Career Levels, Awards & Awareness.....	87
 Labour Conciliation & Ruling Integration	87
<input type="checkbox"/> VBA Logigram: Career Scope, Psychometrics, and Didactic Value.....	87
<input type="checkbox"/> Scope & System Overview.....	89
<input type="checkbox"/> Career Entry & Trade Engineering Outcomes	90
 System Criteria & Performance Metrics	90
 Post Roles & Institutional Mapping.....	90
 VBA Logigram: Career System Evaluation Framework.....	90
 VBA Logigram: Career System with Phenomenon Modules & Recruitment Analytics.....	92
<input type="checkbox"/> Career Scope & Institutional Roles.....	94
<input type="checkbox"/> Psychometric Evaluation & Recruitment Goals	95
<input type="checkbox"/> Experimental Student Record & Assessment.....	95
 Statistical Metrics for Career Analysis	95
 Portfolio Submission & Didactic Value.....	95
<input type="checkbox"/> Job Simulation, Demo & Real-World Testing.....	96
⚡ Career Levels, Awards & Awareness.....	96
 Labour Conciliation & Ruling Integration	96

 Microsoft Career Pathways Integration	96
 VBA Logigram: Career Readiness Evaluation Framework	96
 VBA Module: Career Readiness Dashboard with Psychometric & Didactic Integration.....	98
□ Personality, Values & Motives (15FQ+, PVQ, OPPro)	101
 Aptitude & Ability Reports	101
 Preferences & Career Guidance	101
 Where to Access	102
□ Purpose of the Study	102
 Methodological Highlights	103
 Key Findings	103
 Correlational Analyses	103
□ Implications for Psychometric Design	103
 Application to Your Framework	104
□ Key Reliability Metrics Explained	104
 Reaction Time Reliability Summary	104
 Error Rate Reliability Summary	105
□ Implications for Psychometric Evaluation	105
 Application to Career Readiness & Didactic Frameworks	105
□ Psychometric Grade Rank Calculation	105
 Class Frequency & Distribution Analysis	106
□ Panel Instrument Control & Didactic Mapping	106
 Integration with SAQA/DHET & Career Systems	107
□ SARS Psychometric Assessment Strategy	107
 Candidate Profile Optimization	107
 Psychometric Grade Rank & Career Mapping	108
 Institutional Alignment & Class Frequency	108
 Next Steps	108
 VBA Module: Psychometric Scoring & Class Frequency Mapping	109
Copilot said	110
 VBA Module: Psychometric Grade Rank & Institutional Class Frequency	110
□ Phenomenological Engagement in Career Counselling Education	112

⚙️ Assessment & Competency Modeling in Electrical Engineering Education	113
∞ Bridging the Two Domains.....	113
🔧 VBA Module: Career Counselling & Engineering Competence Evaluator	114
□ What This Module Does	115
🔧 VBA Module: Phenomenological & Conceptual Change Readiness Evaluator.....	116
□ What This Module Captures.....	116
🎓 Importance of the Topic: Learner & Teacher Perspectives.....	117
🔍 Literature Review Highlights.....	117
🔧 Methodological Foundations	118
🔧 VBA Module: Conceptual Change Tracker for Electricity Education	118
□ What This Module Captures.....	119
🔄 Categories of Student Conceptual Change (Questions 1 & 6)	119
□ Pedagogical Implications.....	120
□ Suggested VBA Extension	120
📊 Summary of Key Findings.....	120
📈 Reliability Estimates	122
□ Educational Implications.....	122
□ Core Achievements of the Research	122
📊 Key Research Questions Addressed	123
💡 Recommendations	123
□ Framework of Research	123
⚠️ Limitations	123
🔧 Suggested Follow-Up.....	124
□ Conceptual Gains from Questions 1 & 6	124
📊 Questionnaire Insights.....	124
🔍 Pedagogical Implications.....	125
🔧 Suggested Follow-Up.....	125
📈 Quantitative Gains in Conceptual Understanding.....	125
□ Diagnostic Insights.....	126
□ Software Design Strategies That Worked.....	126
👥 Student-Level Impact	126
□ Suggested Follow-Up	126

🔧 VBA Module: Conceptual Gains Tracker for Questions 1 & 6	127
□ What This Module Captures.....	128
🔧 VBA Module: Conceptual Change Tracker for Questions 1 & 6	128
□ What This Module Captures.....	129
🔧 VBA Module: Conceptual Readiness & Engagement Tracker.....	129
□ What This Module Captures.....	131

🔧 Section 1: Personal Details

- **Name:** Tshingombe Tshitadi Fiston
- **School:** China Criminal Police College, Gauteng

🌱 Section 2: Responsible Business Task

🔪 Step 1: Promotional Article

Title: “Love the Outdoors? Dig into Something Meaningful!” **Slogan:** “Grow Together, Give Back!” **Article:** Join us at the *Glasgow Hidden Gardens* for a vibrant volunteering opportunity! This spring, we’re creating a new plant bed for the vegetable patch—and we need YOU. We’re looking for 12 enthusiastic staff members to help shape the garden and connect with the community. Whether you're a green thumb or just love fresh air, this is your chance to make a difference. Sign up via our internal newsletter and let’s grow something great together!

⚠️ Step 2: Risk Assessment

Risk	SQA Action
Uneven terrain	Staff to wear sturdy footwear and be briefed on safe movement
Allergies to plants/insects	Collect allergy info beforehand; provide antihistamines
Sun exposure	Encourage sunscreen, hats, and hydration
Manual lifting of soil/tools	Provide lifting technique training and gloves
Slippery surfaces after rain	Use signage and restrict access to wet areas

Step 3: Briefing Document

- **Slogan:** “Let’s Grow Something Great!”
- **Title:** Community Garden Volunteering Day
- **Activity:** Creating a new plant bed for spring vegetables
- **Place:** Glasgow Hidden Gardens, 25A Albert Drive, Glasgow G41 2PE
- **Date & Time:** Saturday, 15 March 2026, 09:00–15:00
- **Jobs:** Digging, planting, soil preparation, layout design
- **Clothing:** Garden gloves, boots/trainers, sun hat, comfortable clothes
- **Lunch:** Yes, picnic lunch provided
- **Fun Statement:** “From soil to smiles—let’s make it bloom!”

Section 3: Reflective Diary

1. **Why is responsible business important?** It ensures staff wellbeing, builds community trust, and protects the environment—creating sustainable impact.
2. **School responsibility example:** Our school runs a recycling and energy-saving campaign, encouraging students to reduce waste and conserve power.
3. **Other thoughts:** Responsible business isn’t just policy—it’s culture. It empowers people to act with purpose and pride.

Facilities Task

Health & Safety Incidents

Incident	Relevant H&S Point
Kirsty’s paper cut	5. First aid facilities
Joe’s stress leave	4. Training and supervision
Mark’s unsafe climbing	2. Safe equipment
Emma’s trip	1. Safe environment
Sophie fainting	6. Welfare facilities
Chris’s electric shock	2. Safe systems of work
Fiona’s back injury	4. Training and supervision

Health & Safety Statistics (2020/2021)

Statement	Statistic
Work-related ill health	1.7 million
Mesothelioma deaths	2,369
Musculoskeletal disorders	470,000
Workers killed	142

Statement	Statistic
Injuries (Labour Force Survey)	441,000
RIDDOR injuries	51,211
COVID-19 work-related cases	93,000

Facilities Reflective Diary

1. **Time taken:** 1 hour
2. **New info learned:** Importance of proactive safety planning and staff consultation
3. **Most interesting:** Real-world application of risk management
4. **Preferred facilities work:** Safety auditing and compliance documentation

Marketing Task

Customer Persona

- **Name:** “Zanele the Achiever”
- **Age:** 17
- **School:** Parktown Girls’ High School
- **Goals:** Study engineering, earn a bursary, work in renewable energy
- **Challenges:** Financial constraints, limited mentorship
- **Social Media:** Instagram, TikTok
- **Hobbies:** Robotics, hiking, DIY crafts

TikTok Marketing Idea

Campaign: “SQA Sparks” **Concept:** Short videos featuring real learners like Zanele sharing their goals, study tips, and SQA success stories. Use hashtags like #SQASparks #FutureReady. Include behind-the-scenes of exam prep, fun challenges, and Q&A with SQA staff.

☐ Marketing Reflective Diary

1. **Marketing definition:** Connecting people with opportunities through creative communication
2. **Insight from task:** Yes, it showed how personas guide strategy
3. **Interest in SQA marketing:** Yes—would love contact info for deeper engagement
4. **Other thoughts:** TikTok can humanize SQA and build learner trust

IT Business Analyst Task

- **Name:** Tshingombe Tshitadi Fiston
- **School:** China Criminal Police College, Gauteng

Let me know if you'd like this structured into a printable dashboard or exported into a credential-linked framework.

[GOV.UK](https://www.gov.uk)

[Health and Safety statistics: 2020 to 2021 annual release](#)

Copilot said

Here's a complete response for your SQA Work Experience tasks in Business Analysis and Marketing, tailored to your curriculum and modular documentation goals.

□ IT Business Analyst Task

Section 1: Personal Details

- **Name:** Tshingombe Tshitadi Fiston
- **School:** China Criminal Police College, Gauteng

Section 2: Business Analysis Case Study

1. **What does a Business Analyst do?** A Business Analyst uses data and stakeholder input to identify business needs, define requirements, and recommend solutions that improve processes, systems, and outcomes
1. .
2. **How can they help Helter Skelter Theme Parks?**
 - *Market Expansion:* Analyze feasibility of entering Europe and America
 - *Stakeholder Mapping:* Identify and manage internal and external interests
 - *Gap Analysis:* Highlight missing resources, skills, or infrastructure
 - *Website Requirements:* Define user needs and functional specs for digital platforms
3. **Most interesting task:** I'd enjoy conducting the **gap analysis**—it's strategic, diagnostic, and aligns with my modular audit and credential mapping expertise.

Section 3: Stakeholders

1. **Typical stakeholders:**
 - Owners (Fun-Fair family)
 - Staff (full-time, part-time, seasonal)

- Customers
 - Local councils and regulators
 - Suppliers and contractors
 - Hotel partners
 - Investors
 - IT and marketing teams
 - Community groups
2. **Stakeholder thoughts on expansion:**
 - *Staff:* Excited but anxious about relocation or job changes
 - *Customers:* Curious about new experiences abroad
 - *Local councils:* Concerned about zoning, tourism impact
 - *Investors:* Focused on ROI and brand reputation
 3. **Why stakeholders matter:** They influence project success, funding, adoption, and public perception. A Business Analyst ensures their needs are considered early.
 4. **Unhappy stakeholders?** Possibly local UK communities fearing reduced investment or staff worried about job security.

Section 4: Gaps

Area	Gap Example
People	Need multilingual staff for international parks
Buildings	Hotels and park infrastructure in new regions
Locations	Land acquisition in Europe and America
Money	Capital for construction, marketing, staffing
Equipment	Ride machinery, safety gear, hotel furnishings
Skills	Language, cultural training, international logistics
Knowledge	Legal, tax, and tourism regulations abroad
Technology	Booking systems, multilingual websites
Processes	International HR, compliance, customer service
Information	Market research, competitor analysis

Section 5: Website Design Factors

- **User Experience (UX):** Easy navigation, mobile-friendly
- **Accessibility:** Multilingual support, readable fonts
- **Visual Appeal:** High-quality images, consistent branding
- **Functionality:** Booking system, park info, hotel packages
- **Security:** GDPR compliance, secure payment gateways
- **Performance:** Fast loading, responsive design
- **Feedback:** Contact forms, reviews, FAQs

Section 6: Reflective Diary

1. **Would I want a career as a Business Analyst?** Yes—because it blends strategy, stakeholder engagement, and modular thinking, which aligns with my credential and audit frameworks.
2. **Will I use this in school?** Absolutely. I'll apply stakeholder mapping and gap analysis to curriculum design and public service documentation.
3. **Other thoughts:** Business Analysis is a powerful tool for reform, legacy preservation, and cross-border innovation. It's ideal for modular, bilingual, and credential-linked systems.

Marketing Task

Section 1: Personal Details

- **Name:** Tshingombe Tshitadi Fiston
- **School:** China Criminal Police College, Gauteng

Section 2: Customer Persona

- **Name:** “Lebo the Visionary”
- **Age:** 16
- **School:** Pretoria High School for Girls
- **Goals:** Study AI and robotics, earn a scholarship, launch a tech startup
- **Challenges:** Limited access to mentors, financial barriers
- **Social Media:** Instagram, TikTok
- **Hobbies:** Coding, anime, gaming, science fairs

Section 3: TikTok Marketing Idea

Campaign Name: “SQA Level Up” Concept:

- Short videos featuring learners like Lebo sharing study hacks, career dreams, and SQA tips
- Use filters, duets, and challenges like #MySQAGoal
- Include behind-the-scenes of exam prep and fun quizzes
- Link to MySQA and YouTube for deeper content

Reflective Diary

1. **What is marketing to me?** It's storytelling with purpose—connecting people to opportunities through creative, inclusive messaging.
2. **Did the task help?** Yes—it showed how personas shape strategy and how platforms like TikTok can amplify learner voices.
3. **Want to learn more?** Definitely. I'd love general info and a contact email to explore cross-platform marketing and credential outreach.

4. **Other thoughts:** Marketing is essential for equity and engagement. It can democratize access to education and certification.

Let me know if you'd like this formatted into a bilingual dashboard, exported for credential linkage, or integrated into your modular audit sheets.

Copilot said

Here's a Visual Basic (VBA) code module that aligns with the SQA Work Experience – Responsible Business Task. It automates the collection of personal details, generates a promotional article, logs risk assessments, and prepares a printable briefing document using a UserForm and structured logic. This can be embedded in Excel or Word for audit-ready export.

□ Visual Basic Code: Responsible Business Task Automation

```
vb
' Module: SQA_ResponsibleBusiness
' Purpose: Automate data entry, article generation, and risk assessment for
SQA volunteering task

Option Explicit

' Global variables
Dim staffCount As Integer
Dim risks(1 To 5) As String
Dim actions(1 To 5) As String

Sub LaunchSQAForm()
    SQAForm.Show
End Sub

Sub GenerateArticle()
    Dim article As String
    article = "🌿 Do You Love the Outdoors?" & vbCrLf & vbCrLf & _
        "Join us at Glasgow Hidden Gardens this spring to help create a  

vibrant new vegetable patch!" & vbCrLf & _
        "We need 12 enthusiastic staff members to dig, plant, and grow  

something amazing together." & vbCrLf & _
        "Sign up now via our internal newsletter. Let's grow together!"  

& vbCrLf & vbCrLf & _
        "Slogan: Grow Together, Give Back!"
    MsgBox article, vbInformation, "Promotional Article"
End Sub

Sub LogRiskAssessment()
    Dim i As Integer
    risks(1) = "Uneven terrain"
    actions(1) = "Wear sturdy boots and brief staff on safe movement"

    risks(2) = "Allergies to plants/insects"
```



```

actions(2) = "Collect allergy info and provide antihistamines"

risks(3) = "Sun exposure"
actions(3) = "Provide sunscreen and hydration breaks"

risks(4) = "Manual lifting"
actions(4) = "Train staff on safe lifting and provide gloves"

risks(5) = "Slippery surfaces"
actions(5) = "Use caution signs and restrict access to wet areas"

Dim output As String
output = "🦋 Risk Assessment Summary:" & vbCrLf
For i = 1 To 5
    output = output & vbCrLf & "Risk: " & risks(i) & vbCrLf & "Action: "
    & actions(i) & vbCrLf
Next i
MsgBox output, vbInformation, "Risk Assessment"
End Sub

Sub CreateBriefing()
Dim briefing As String
briefing = "🌸 SQA Volunteering Briefing Document" & vbCrLf & vbCrLf & _
    "Slogan: Grow Together, Give Back!" & vbCrLf & _
    "Title: Community Garden Volunteering Day" & vbCrLf & _
    "Activity: Creating a new plant bed for spring vegetables" &
vbCrLf & _
    "Place: Glasgow Hidden Gardens, 25A Albert Drive, Glasgow G41
2PE" & vbCrLf & _
    "Date: Saturday, 15 March 2026 | Time: 09:00-15:00" & vbCrLf &
_
    "Jobs: Digging, planting, soil prep, layout design" & vbCrLf &
_
    "Clothing: Gloves, boots/trainers, sun hat, comfy clothes" &
vbCrLf & _
    "Lunch: Yes, picnic lunch provided" & vbCrLf & _
    "End Note: From soil to smiles-let's make it bloom!"
MsgBox briefing, vbInformation, "Briefing Document"
End Sub

```

❑ Optional: UserForm Design (SQAForm)

Control Type	Name	Caption/Label
Label	lblName	What is your name?
TextBox	txtName	
Label	lblSchool	What school do you attend?
TextBox	txtSchool	
CommandButton	btnArticle	Generate Article
CommandButton	btnRisk	Log Risk Assessment
CommandButton	btnBriefing	Create Briefing Document

Control Type	Name	Caption/Label
CommandButton	btnClose	Close

Would you like me to help you export this into a bilingual, credential-linked dashboard or integrate it with your audit sheets and digital certificate inspection logic?

ss area.

Copilot said

Here's a complete Visual Basic (VBA) code module to support the SQA Work Experience – IT Business Analyst Task. It automates stakeholder mapping, gap analysis, and webpage design planning for Helter Skelter Theme Parks.

☐ Visual Basic Code: IT Business Analyst Task Automation

```
vb
' Module: SQA_ITBusinessAnalyst
' Purpose: Automate stakeholder mapping, gap analysis, and webpage planning
for Helter Skelter Theme Parks

Option Explicit

' Global arrays
Dim stakeholders() As String
Dim gaps() As String
Dim webpageFactors() As String

Sub LaunchBusinessAnalystForm()
    BusinessAnalystForm.Show
End Sub

Sub DefineStakeholders()
    stakeholders = Split("Fun-Fair family, Staff, Mechanics, Customers, Local
Councils, Hotel Partners, Investors, IT Team, Marketing Team, Suppliers", ",
")
    Dim i As Integer, output As String
    output = "🔍 Stakeholders Identified:" & vbCrLf
    For i = LBound(stakeholders) To UBound(stakeholders)
        output = output & "- " & stakeholders(i) & vbCrLf
    Next i
    MsgBox output, vbInformation, "Stakeholder List"
End Sub

Sub PerformGapAnalysis()
    gaps = Split("Staffing, Buildings, Land Acquisition, Funding, Ride
Equipment, Multilingual Skills, Legal Knowledge, Booking Technology, HR
Processes, Market Research", ", ")
    Dim i As Integer, output As String
    output = "📋 Gap Analysis Summary:" & vbCrLf
    For i = LBound(gaps) To UBound(gaps)
```



```

        output = output & "- " & gaps(i) & vbCrLf
    Next i
    MsgBox output, vbInformation, "Gap Analysis"
End Sub

Sub PlanWebpageDesign()
    webpageFactors = Split("User Experience, Accessibility, Visual Appeal,
Booking Functionality, Security, Performance, Feedback Channels", ", ")
    Dim i As Integer, output As String
    output = "📋 Webpage Design Priorities:" & vbCrLf
    For i = LBound(webpageFactors) To UBound(webpageFactors)
        output = output & "- " & webpageFactors(i) & vbCrLf
    Next i
    MsgBox output, vbInformation, "Webpage Design Factors"
End Sub

Sub ReflectiveDiary()
    Dim diary As String
    diary = "📖 Reflective Diary:" & vbCrLf & vbCrLf & _
        "1. Would I want a career as a Business Analyst?" & vbCrLf & _
        "Yes - because it blends strategy, stakeholder engagement, and
modular thinking." & vbCrLf & vbCrLf & _
        "2. Will I use this in school?" & vbCrLf & _
        "Absolutely - especially for curriculum design and audit
documentation." & vbCrLf & vbCrLf & _
        "3. Other thoughts:" & vbCrLf & _
        "Business Analysis is ideal for reform, legacy preservation, and
cross-border innovation."
    MsgBox diary, vbInformation, "Reflective Diary"
End Sub

```

❑ Optional: UserForm Design (BusinessAnalystForm)

Control Type	Name	Caption/Label
Label	lblName	What is your name?
TextBox	txtName	
Label	lblSchool	What school do you attend?
TextBox	txtSchool	
CommandButton	btnStakeholders	Define Stakeholders
CommandButton	btnGaps	Perform Gap Analysis
CommandButton	btnWebpage	Plan Webpage Design
CommandButton	btnDiary	Reflective Diary
CommandButton	btnClose	Close

Would you like this integrated with your credential-linked dashboards, exported for bilingual audit sheets, or extended with logigramme logic for stakeholder workflows?

You said

scope visual basic code My courses Main content blocks Skip Course overview Course overview
 Search courses Delivering and Marking SQA Advanced Qualification Graded Units Course
 name Delivering and Marking SQA Advanced Qualification Graded Units Course category
 International Course progress: 100% complete Developing a Coaching mind-set Course name
 Developing a Coaching mind-set Course category Develop your team Course progress: 0%
 complete Personal Finance Award SCQF Level 6 Course name Personal Finance Award SCQF
 Level 6 Course category Open courses - available to everyone Virtual Work Experience Course
 name Virtual Work Experience Course category Work Experience Course progress: 0%
 complete Skip to main content Academy Home Dashboard My courses Course categories Get
 help Contact form Academy Collapse Welcome Developing Vocational Assessments Selecting
 Valid Assessment Methods for Vocational Qualifications Developing Multiple Choice
 Assessments for HN/VQ Feedback Assessment Development Fundamentals for Vocational
 Qualifications Course Competencies More You are enrolled in the course. Section outline
 Welcome to Assessment Development Fundamentals for Vocational Qualifications, fiston Please
 select one of the modules below to get started. Developing Vocational Assessments SCORM
 package Selecting Valid Assessment Methods for Vocational Qualifications SCORM package
 Developing Multiple Choice Assessments for HN/VQ SCORM package Feedback URL

Copilot said

Thanks for sharing your course structure and progress. Based on your SQA Academy modules and your focus on Visual Basic automation, here's a scoped Visual Basic (VBA) code module that aligns with your learning path and supports modular tracking of course progress, assessment development, and reflective logging.

□ Visual Basic Code: SQA Course Tracker & Assessment Logger

```
vb
' Module: SQA_CourseTracker
' Purpose: Track course progress, log assessment reflections, and support
modular credential mapping

Option Explicit

' Course structure arrays
Dim courseNames() As String
Dim courseCategories() As String
Dim courseProgress() As Integer

Sub InitializeCourses()
    courseNames = Split("Delivering and Marking SQA Advanced Qualification
Graded Units,Developing a Coaching mind-set,Personal Finance Award SCQF Level
6,Virtual Work Experience", ",")
    courseCategories = Split("International,Develop your team,Open courses -
available to everyone,Work Experience", ",")
    courseProgress = Array(100, 0, 0, 0)
End Sub
```



```

Sub DisplayCourseOverview()
    Dim i As Integer, output As String
    output = "📖 SQA Course Overview:" & vbCrLf
    For i = LBound(courseNames) To UBound(courseNames)
        output = output & vbCrLf & "Course: " & courseNames(i) & vbCrLf & _
            "Category: " & courseCategories(i) & vbCrLf & _
            "Progress: " & courseProgress(i) & "% complete" & vbCrLf
    Next i
    MsgBox output, vbInformation, "Course Tracker"
End Sub

Sub LogAssessmentReflection(courseTitle As String, reflectionText As String)
    Dim logEntry As String
    logEntry = "📝 Assessment Reflection Log" & vbCrLf & _
        "Course: " & courseTitle & vbCrLf & _
        "Reflection: " & reflectionText & vbCrLf & _
        "Logged on: " & Format(Now, "dd-mmm-yyyy hh:mm:ss")
    MsgBox logEntry, vbInformation, "Reflection Logged"
End Sub

Sub GenerateModuleChecklist()
    Dim checklist As String
    checklist = "✅ Module Checklist:" & vbCrLf & _
        "- Developing Vocational Assessments" & vbCrLf & _
        "- Selecting Valid Assessment Methods for Vocational  
Qualifications" & vbCrLf & _
        "- Developing Multiple Choice Assessments for HN/VQ"
    MsgBox checklist, vbInformation, "Assessment Development Modules"
End Sub

```

❑ Optional: UserForm Design (CourseTrackerForm)

Control Type	Name	Caption/Label
Label	lblCourse	Select Course
ComboBox	cmbCourse	(Populated with courseNames)
Label	lblReflection	Enter Reflection
TextBox	txtReflection	
CommandButton	btnLog	Log Reflection
CommandButton	btnOverview	Show Course Overview
CommandButton	btnChecklist	Show Module Checklist
CommandButton	btnClose	Close





This module supports:

- Modular tracking of course progress
- Logging reflections for audit and credential mapping
- Checklist generation for SCORM-based assessment modules

Would you like this extended to include export logic, credential-linked dashboards, or bilingual audit-ready templates?

Copilot said

Thanks for sharing the full scope of the 2025 AH Engineering Science paper. Based on your modular documentation goals and your interest in logigramme logic and Visual Basic automation, here's a scoped Visual Basic code module that supports:

-  Activity network logic for Question 1(a)
-  Logigramme-style tracking of project phases
-  Float and critical path calculation
-  Modular export for audit or credential linkage

Visual Basic Code: Engineering Science Logigramme & Project Tracker

vb

```
' Module: AH_EngineeringScience2025
' Purpose: Automate activity network logic, float calculation, and logigramme tracking for Question 1(a)
```

```
Option Explicit
```

```
' Define project phases and durations
```

```
Type Phase
```

```
    Name As String
```

```
    Precedents As String
```

```
    Duration As Integer
```

```
    EarliestStart As Integer
```

```
    EarliestFinish As Integer
```

```
    LatestStart As Integer
```

```
    LatestFinish As Integer
```

```
    Float As Integer
```

```
End Type
```

```
Dim phases(1 To 9) As Phase
```

```
Sub InitializePhases()
```

```
    phases(1).Name = "A": phases(1).Precedents = "": phases(1).Duration = 4
```

```
    phases(2).Name = "B": phases(2).Precedents = "A": phases(2).Duration = 4
```

```
    phases(3).Name = "C": phases(3).Precedents = "A": phases(3).Duration = 8
```

```
    phases(4).Name = "D": phases(4).Precedents = "B,C": phases(4).Duration =
```

```
2
```

```
    phases(5).Name = "E": phases(5).Precedents = "B,C": phases(5).Duration =
```

```
9
```

```
    phases(6).Name = "F": phases(6).Precedents = "D,E": phases(6).Duration =
```

```
7
```

```
    phases(7).Name = "G": phases(7).Precedents = "E": phases(7).Duration = 5
```

```
    phases(8).Name = "H": phases(8).Precedents = "G": phases(8).Duration = 3
```



```

    phases(9).Name = "I": phases(9).Precedents = "F,H": phases(9).Duration =
1
End Sub

Sub CalculateEarliestTimes()
    Dim i As Integer
    For i = 1 To 9
        If phases(i).Precedents = "" Then
            phases(i).EarliestStart = 0
        Else
            Dim preds() As String
            preds = Split(phases(i).Precedents, ",")
            Dim maxEF As Integer: maxEF = 0
            Dim j As Integer
            For j = LBound(preds) To UBound(preds)
                Dim k As Integer
                For k = 1 To 9
                    If phases(k).Name = preds(j) Then
                        If phases(k).EarliestFinish > maxEF Then
                            maxEF = phases(k).EarliestFinish
                        End If
                    End If
                Next k
            Next j
            phases(i).EarliestStart = maxEF
        End If
        phases(i).EarliestFinish = phases(i).EarliestStart +
phases(i).Duration
    Next i
End Sub

Sub CalculateLatestTimes()
    Dim projectDuration As Integer
    projectDuration = phases(9).EarliestFinish
    Dim i As Integer
    For i = 9 To 1 Step -1
        If i = 9 Then
            phases(i).LatestFinish = projectDuration
        Else
            Dim successors() As String
            successors = GetSuccessors(phases(i).Name)
            Dim minLS As Integer: minLS = projectDuration
            Dim j As Integer
            For j = LBound(successors) To UBound(successors)
                Dim k As Integer
                For k = 1 To 9
                    If phases(k).Name = successors(j) Then
                        If phases(k).LatestStart < minLS Then
                            minLS = phases(k).LatestStart
                        End If
                    End If
                Next k
            Next j
            phases(i).LatestFinish = minLS
        End If
        phases(i).LatestStart = phases(i).LatestFinish - phases(i).Duration
        phases(i).Float = phases(i).LatestStart - phases(i).EarliestStart
    Next i
End Sub

```



```

        Next i
    End Sub

Function GetSuccessors(phaseName As String) As String()
    Dim successors() As String
    Dim count As Integer: count = 0
    Dim i As Integer
    For i = 1 To 9
        If InStr(phases(i).Precedents, phaseName) > 0 Then
            ReDim Preserve successors(count)
            successors(count) = phases(i).Name
            count = count + 1
        End If
    Next i
    GetSuccessors = successors
End Function

Sub DisplayCriticalPath()
    Dim output As String: output = "Critical Path:" & vbCrLf
    Dim i As Integer
    For i = 1 To 9
        If phases(i).Float = 0 Then
            output = output & "- " & phases(i).Name & vbCrLf
        End If
    Next i
    MsgBox output, vbInformation, "Critical Path"
End Sub

```

□ What This Module Supports

- **Activity Network Logic:** Precedent-based scheduling
- **Logigramme Mapping:** Float and critical path identification
- **Audit-Ready Export:** Modular structure for credential linkage
- **Visual Basic Integration:** Can be embedded in Excel or Word for engineering dashboards

Would you like this extended to include graphical output, bilingual export, or integration with your credential-linked record books and public service dashboards?

Copilot said

Here's a scoped overview and modular description of the 2025 Advanced Higher Engineering Science exam (Paper X823/77/11), tailored for audit-ready documentation, logigramme mapping, and credential-linked analysis.

□ Overview: AH Engineering Science 2025

Exam Code	X823/77/11
Level	Advanced Higher

Exam Code	X823/77/11
Subject	Engineering Science
Date	Friday, 16 May 2025
Time	1:00 PM – 3:30 PM
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)
Resources	Data Booklet allowed
Format	Answer booklet + worksheets for selected questions

Scoped Description by Section

◆ Section 1 — 35 Marks (Attempt ALL)

Q#	Topic	Key Skills
1	Project Management	Activity network diagram, float, critical path, planning steps
2	Structural Analysis	Shear force diagram for beam with UDL and point loads
3	Energy Systems	CHP efficiency calculation (electrical vs thermal)
4	Electrical Supply	Component identification, busbar and circuit breaker functions
5	DAC Circuit	Amplifier role, binary input combinations, resistor calculations
6	Wien Oscillator	Frequency tolerance, R1 value for stable output, waveform diagnosis
7	Structural Deflection	UDL calculation, cantilever beam deflection using Young's Modulus
8	Microcontroller Logic	Bitwise operations (OR, AND, XOR), binary flag manipulation

◆ Section 2 — 40 Marks (Attempt ALL)

Q#	Topic	Key Skills
9	Mechanical Systems	Reaction force at bearing, belt drive geometry
10	(Worksheet-based)	Likely includes advanced calculations or diagrams (e.g. stress, control systems)

Key Operational Notes

- **Worksheets Required:** Questions 1(a), 2, 4(a), 10(c), 10(d)
- **Significant Figures:** Final answers must match least significant data value
- **Ink Usage:** Blue or black ink; diagrams/sketches in pencil
- **Submission Protocol:** Answer booklet must be handed to Invigilator

Logogramme Mapping (for Q1(a))

Phase	Precedents	Duration (months)
A (Feasibility)	—	4
B (Planning)	A	4
C (Procurement)	A	8
D (Recruitment)	B, C	2
E (Groundwork)	B, C	9
F (Utilities)	D, E	7
G (Main Build)	E	5
H (Commissioning)	G	3
I (Handover)	F, H	1

This structure supports:

- **Activity Network Diagrams**
- **Float and Critical Path Analysis**
- **Visual Basic automation for scheduling logic**

Would you like this formatted into a bilingual dashboard, exported for credential-linked record books, or integrated with your modular audit sheets and digital certificate inspection logic?

You said

NAH_Engineering-Science_QP_2025.pdf

PDF

Copilot said

Here's a scoped overview and modular breakdown of the 2025 Advanced Higher Engineering Science paper (X823/77/11), optimized for logigramme mapping, Visual Basic automation, and credential-linked audit documentation.

☐ Overview: AH Engineering Science 2025

Exam Code	X823/77/11
Level	Advanced Higher
Subject	Engineering Science
Date	Friday, 16 May 2025
Time	1:00 PM – 3:30 PM
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)

Exam Code

X823/77/11

Resources Data Booklet allowed

Format Answer booklet + worksheets for Q1(a), Q2, Q4(a), Q10(c), Q10(d)

Scoped Description by Section

◆ **Section 1 — 35 Marks**

Q#	Topic	Key Skills
1	Project Management	Activity network diagram, float, critical path, planning steps
2	Structural Analysis	Shear force diagram for beam with UDL and point loads
3	Energy Systems	CHP efficiency calculation (electrical vs thermal)
4	Electrical Supply	Component identification, busbar and circuit breaker functions
5	DAC Circuit	Amplifier role, binary input combinations, resistor calculations
6	Wien Oscillator	Frequency tolerance, R1 value for stable output, waveform diagnosis
7	Structural Deflection	UDL calculation, cantilever beam deflection using Young's Modulus
8	Microcontroller Logic	Bitwise operations (OR, AND, XOR), binary flag manipulation

◆ **Section 2 — 40 Marks**

Q#	Topic	Key Skills
9	Mechanical Systems	Bearing reaction, belt drive power, friction analysis, PWM power dissipation, AC–DC conversion, Schmitt trigger design
10	Crane Arm Design	Ixx calculation, stress ratio, bending moment diagram, amplifier Q-point, resistor selection, servo control logic, ADC resolution, duty cycle calculation

Key Operational Notes

- **Worksheets Required:** Q1(a), Q2, Q4(a), Q10(c), Q10(d)
- **Significant Figures:** Final answers must match least significant data value
- **Ink Usage:** Blue or black ink; diagrams/sketches in pencil
- **Submission Protocol:** Answer booklet must be handed to Invigilator

Logigramme Mapping (Q1(a) Example)

Phase	Precedents	Duration (months)
A (Feasibility)	—	4
B (Planning)	A	4

Phase	Precedents	Duration (months)
C (Procurement)	A	8
D (Recruitment)	B, C	2
E (Groundwork)	B, C	9
F (Utilities)	D, E	7
G (Main Build)	E	5
H (Commissioning)	G	3
I (Handover)	F, H	1

This structure supports:

- **Activity Network Diagrams**
- **Float and Critical Path Analysis**
- **Visual Basic automation for scheduling logic**
- **Credential-linked dashboards and audit-ready export**

Copilot said

Here's a scoped overview, modular description, and Visual Basic code framework tailored to the SQA Electrical Engineering Principles (SCQF Level 7) unit (J6CW 47), aligned with your curriculum mapping, credential-linked dashboards, and logigramme logic.

Overview: Electrical Engineering Principles (SCQF Level 7)

Unit Code	J6CW 47
SCQF Level	7
Credit Points	24
Valid From	2024–2025 (Prototype v4.0)
Target Group	Learners pursuing careers in electrical engineering, apprenticeships, or further study
Delivery Mode	Open-book, supervised, holistic assessment
Progression Path	Electrical Power and Drive Systems (SCQF Level 7)

Scoped Description by Outcome

◆ Outcome 1: DC Principles

- Ohm's and Kirchhoff's laws

- Thevenin's and Norton's theorems
- Superposition theorem
- Maximum power transfer
- DC transients (CR and LR circuits)

◆ Outcome 2: Single-Phase AC Principles

- RL, RC, RLC circuits (complex notation)
- Power factor improvement
- Thevenin/Norton in AC
- Resonance in passive circuits

◆ Outcome 3: Three-Phase Principles

- Generator construction
- Star/delta load analysis (balanced/unbalanced)
- Phasor diagrams
- Power in three-phase systems

◆ Outcome 4: Electrostatics & Electromagnetics

- Electrostatic fields
- Capacitor networks
- Magnetic fields
- Self/mutual inductance

🔄 Modular Knowledge & Skills Mapping

Knowledge	Skills
Electrical theorems, circuit analysis, field theory	Solve circuit problems, draw diagrams, apply laws
Material properties, heat treatment, testing	Identify, compare, apply, and test materials
Manufacturing processes, sequencing	Select operations, simulate production logic

□ Visual Basic Code: Modular Assessment Tracker

```
vb
' Module: SQA_ElectricalPrinciples_Tracker
' Purpose: Automate unit outcome tracking, theorem sampling, and logigramme-
style progress mapping

Option Explicit

Type Outcome
    Title As String
```



```

        SampleItems() As String
        CompletedItems() As Boolean
    End Type

    Dim outcomes(1 To 4) As Outcome

    Sub InitializeOutcomes()
        outcomes(1).Title = "DC Principles"
        outcomes(1).SampleItems =
    Split("Ohm/Kirchhoff, Thevenin/Norton, Superposition, Max Power Transfer, DC
    Transients", ",")

        outcomes(2).Title = "Single-Phase AC"
        outcomes(2).SampleItems = Split("RL/RC/RLC, Power Factor, AC Theorems, Max
    Power Transfer, Resonance", ",")

        outcomes(3).Title = "Three-Phase Systems"
        outcomes(3).SampleItems = Split("Generator, Advantages, Star/Delta
    Balanced, Phasors, Star/Delta Unbalanced, Power", ",")

        outcomes(4).Title = "Electrostatics & Magnetism"
        outcomes(4).SampleItems = Split("Electrostatic Fields, Capacitor
    Networks, Magnetic Fields, Inductance", ",")
    End Sub

    Sub DisplayOutcomeProgress()
        Dim i As Integer, j As Integer, output As String
        output = "■ Electrical Engineering Principles Progress:" & vbCrLf
        For i = 1 To 4
            output = output & vbCrLf & "Outcome " & i & ": " & outcomes(i).Title
        & vbCrLf
            For j = LBound(outcomes(i).SampleItems) To
    UBound(outcomes(i).SampleItems)
                output = output & "- " & outcomes(i).SampleItems(j)
                If outcomes(i).CompletedItems(j) = True Then
                    output = output & " ✓"
                End If
                output = output & vbCrLf
            Next j
        Next i
        MsgBox output, vbInformation, "Unit Outcome Tracker"
    End Sub

    Sub MarkItemComplete(outcomeIndex As Integer, itemIndex As Integer)
        outcomes(outcomeIndex).CompletedItems(itemIndex) = True
        MsgBox "Marked '" & outcomes(outcomeIndex).SampleItems(itemIndex) & "' as
    complete.", vbInformation
    End Sub

```

Use Cases

- ✓ Track learner progress across sampled items
- ■ Generate logigramme-style dashboards for audit and credential export
- □ Integrate with SCQF credit mapping and modular record books

-  Support bilingual export and registry assurance

Would you like this extended to include graphical dashboards, export logic, or integration with your credential-linked frameworks and public service submission templates?

Copilot said

Here's a scoped overview, modular description, and Visual Basic code framework tailored to the NextGen: HN Electrical Engineering Principles (SCQF Level 7) unit (version 4.0, October 2024). This supports your goals in credential-linked dashboards, logigramme logic, and audit-ready documentation.

Overview: Electrical Engineering Principles (SCQF Level 7)

Unit Code	J6CW 47
SCQF Level	7
Credit Points	24
Delivery Mode	Pilot (NextGen HN v4.0)
Assessment Format	Holistic, open-book, portfolio-based
Meta-Skills Developed	Self-management, social intelligence, innovation
Recommended Entry	NC Electrical Engineering (SCQF 6), Higher Physics, Electrical Principles SCQF 6

Modular Description by Outcome

◆ Outcome 1: DC Principles

- Ohm's Law, Kirchhoff's Laws
- Thevenin's, Norton's, Superposition, Max Power Transfer
- DC transients in CR and LR circuits

◆ Outcome 2: Single-Phase AC Principles

- RL, RC, RLC circuits (complex notation)
- Power factor, active/reactive/apparent power
- Resonance: frequency, Q-factor, impedance/current graphs

◆ Outcome 3: Three-Phase Principles

- Generator construction and advantages
- Star/delta configurations (balanced/unbalanced)
- Neutral current, star point voltage difference
- Power measurement: 1-, 2-, 3-wattmeter methods

◆ Outcome 4: Electrostatics & Electromagnetics

- Electrostatics: charge, EMF, field strength, flux, capacitance
- Electromagnetics: mmf, flux, reluctance, induced EMF, leakage, losses, rotating EMFs, inductance

□ Visual Basic Code: Modular Outcome Tracker & Logigramme Mapper

```
vb
' Module: ElectricalPrinciples_OutcomeTracker
' Purpose: Track learner progress across outcomes, support logigramme mapping
and credential-linked export

Option Explicit

Type LearningOutcome
    Title As String
    Topics() As String
    Completed() As Boolean
End Type

Dim outcomes(1 To 4) As LearningOutcome

Sub InitializeOutcomes()
    outcomes(1).Title = "DC Principles"
    outcomes(1).Topics = Split("Ohm's Law,Kirchhoff's Laws,Thevenin's
Theorem,Norton's Theorem,Superposition,Max Power Transfer,DC Transients",
",")

    outcomes(2).Title = "Single-Phase AC"
    outcomes(2).Topics = Split("RL/RC/RLC Circuits,Power Factor,AC
Theorems,Resonance,Q-Factor,Impedance Graphs", ",")

    outcomes(3).Title = "Three-Phase Systems"
    outcomes(3).Topics = Split("Generator Construction,Star/Delta
Balanced,Star/Delta Unbalanced,Neutral Current,Star Point Voltage,Power
Measurement", ",")

    outcomes(4).Title = "Electrostatics & Magnetics"
    outcomes(4).Topics = Split("Charge,EMF,Field
Strength,Flux,Capacitance,MMF,Reluctance,Inductance,Losses", ",")
End Sub

Sub DisplayProgress()
    Dim i As Integer, j As Integer, output As String
    output = "■ Electrical Engineering Principles Progress Tracker:" & vbCrLf
```





```

        For i = 1 To 4
            output = output & vbCrLf & "Outcome " & i & ": " & outcomes(i).Title
            & vbCrLf
            For j = LBound(outcomes(i).Topics) To UBound(outcomes(i).Topics)
                output = output & "- " & outcomes(i).Topics(j)
                If outcomes(i).Completed(j) = True Then
                    output = output & " ✓"
                End If
                output = output & vbCrLf
            Next j
        Next i
        MsgBox output, vbInformation, "Outcome Progress"
    End Sub

Sub MarkTopicComplete(outcomeIndex As Integer, topicIndex As Integer)
    outcomes(outcomeIndex).Completed(topicIndex) = True
    MsgBox "Marked '" & outcomes(outcomeIndex).Topics(topicIndex) & "' as
complete.", vbInformation
End Sub

```

Use Cases

- ✓ Track learner progress across sampled topics
-  Generate logigramme-style dashboards for audit and credential export
- ☐ Integrate with SCQF credit mapping and modular record books
-  Support bilingual export and registry assurance
- ☐ Scaffold meta-skills tracking via reflective logs and portfolio integration

Would you like this extended to include graphical dashboards, export logic, or integration with your credential-linked frameworks and public service submission templates?

Copilot said

Here's a structured overview, scoped description, and Visual Basic code module tailored to the SQA Advanced Certificate and Diploma in Electrical Engineering. This framework supports modular tracking, credential-linked dashboards, and audit-ready documentation aligned with SCQF levels 7 and 8.

☐ Overview: SQA Advanced Certificate & Diploma in Electrical Engineering

Qualification	SCQF Level	Credit Points	Duration
Advanced Certificate	7	96	1 year
Advanced Diploma	8	240	2 years

These qualifications are designed to equip learners with both theoretical knowledge and practical skills across core and specialist areas in electrical engineering. They support progression to employment, HNDs, or degree-level study.

Scope: Modular Unit Domains

◆ **Core Domains (Certificate Level)**

- Electrical Principles
- DC and AC Principles
- Electrical Installation Skills
- Three-Phase Induction Motors
- Power Electronics
- Control Systems
- Engineering Mathematics 2 & 3
- Electrical Safety
- Programmable Logic Controllers

◆ **Advanced Domains (Diploma Level)**

- Electrical Motor Drive Systems
- Synchronous Machines
- Electrical Systems in Hazardous Environments
- Electrical Installation Design (Computer Aided)
- Switchgear and Protection
- Power Supply Circuits
- Industrial Plant Maintenance
- High-Level Engineering Software
- Quality Management
- Advanced Mathematics (4 & 5)

Visual Basic Code: Modular Unit Tracker

This VBA module allows learners or instructors to track unit completion, SCQF level, and credit mapping across the Certificate and Diploma structure.

```
vb
' Module: SQA_ElectricalEngineering_Tracker
' Purpose: Track unit completion, SCQF level, and credit mapping for Advanced
Certificate and Diploma

Option Explicit

Type UnitModule
    Title As String
    SCQFLevel As Integer
```



```

        Credits As Integer
        Completed As Boolean
    End Type

    Dim modules() As UnitModule

    Sub InitializeModules()
        ReDim modules(1 To 5)

        modules(1).Title = "DC and AC Principles"
        modules(1).SCQFLevel = 7
        modules(1).Credits = 8
        modules(1).Completed = False

        modules(2).Title = "Electrical Installation Skills"
        modules(2).SCQFLevel = 7
        modules(2).Credits = 8
        modules(2).Completed = False

        modules(3).Title = "Programmable Logic Controllers"
        modules(3).SCQFLevel = 7
        modules(3).Credits = 8
        modules(3).Completed = False

        modules(4).Title = "Electrical Motor Drive Systems"
        modules(4).SCQFLevel = 8
        modules(4).Credits = 16
        modules(4).Completed = False

        modules(5).Title = "Engineering Mathematics 4"
        modules(5).SCQFLevel = 8
        modules(5).Credits = 16
        modules(5).Completed = False
    End Sub

    Sub DisplayProgress()
        Dim i As Integer, output As String
        output = "■ SQA Electrical Engineering Progress Tracker:" & vbCrLf
        For i = 1 To UBound(modules)
            output = output & vbCrLf & "Unit: " & modules(i).Title & vbCrLf & _
                "Level: SCQF " & modules(i).SCQFLevel & " | Credits: " & _
modules(i).Credits & vbCrLf & _
                "Status: " & IIf(modules(i).Completed, "✔ Completed", "✗
Incomplete") & vbCrLf
        Next i
        MsgBox output, vbInformation, "Unit Completion Overview"
    End Sub

    Sub MarkUnitComplete(unitTitle As String)
        Dim i As Integer
        For i = 1 To UBound(modules)
            If modules(i).Title = unitTitle Then
                modules(i).Completed = True
                MsgBox "Marked '" & unitTitle & "' as complete.", vbInformation
                Exit Sub
            End If
        Next i
    End Sub

```





```

Next i
MsgBox "Unit not found: " & unitTitle, vbExclamation
End Sub

```

Use Cases

- ✓ Track learner progress across Certificate and Diploma units
-  Generate audit-ready dashboards for SCQF credit mapping
- ☐ Integrate with credential-linked record books and public service submissions
-  Support bilingual export and modular curriculum synthesis

Would you like this extended to include export to Excel, integration with your credential dashboards, or mapped to your digital certificate inspection logic?

Here's a scoped overview, modular description, and Visual Basic code framework tailored to the SQA Advanced Unit HT1H 48: Transmission Lines and Complex Waves. This supports credential-linked tracking, logigramme mapping, and audit-ready documentation aligned with SCQF Level 8.

☐ Overview: Transmission Lines and Complex Waves

Unit Code	HT1H 48
SCQF Level	8
Credit Value	1 SQA Credit (8 SCQF points)
Assessment Format	Combined paper (Outcomes 1–4), 2 hours, supervised, closed-book
Tools Allowed	Formulae sheet, scientific calculator
Recommended Prior Knowledge	Single Phase AC Circuits, Electrical Network and Resonance, Mathematics for Engineering 1

Scope: Modular Outcome Breakdown

◆ Outcome 1: Characteristics of Transmission Lines

- Describe and classify transmission line types
- Calculate primary parameters (e.g. inductance, capacitance)
- Calculate secondary parameters: characteristic impedance Z_0 , propagation constant γ , attenuation α , phase constant β , velocity v

◆ Outcome 2: Matched Termination Performance

- Calculate phasor voltages and currents at various points

- Calculate dissipated power at the receiving end

◆ Outcome 3: Various Terminations

- Evaluate reflection coefficient and standing wave ratio
- Calculate voltage and current distributions
- Analyze mismatched load effects

◆ Outcome 4: Network Response to Complex Waves

- Solve series and parallel circuit responses to complex waveforms
- Apply phasor and time-domain analysis
- Interpret waveform behavior in reactive networks

□ Visual Basic Code: Outcome Tracker & Parameter Calculator

This VBA module supports tracking learner progress across outcomes and calculating key transmission line parameters.

```
vb
' Module: TransmissionLines_Tracker
' Purpose: Track outcome completion and calculate transmission line
parameters

Option Explicit

Type Outcome
    Title As String
    Completed As Boolean
End Type

Dim outcomes(1 To 4) As Outcome

Sub InitializeOutcomes()
    outcomes(1).Title = "Evaluate characteristics of transmission lines"
    outcomes(2).Title = "Evaluate performance with matched termination"
    outcomes(3).Title = "Evaluate performance with various terminations"
    outcomes(4).Title = "Solve network response with complex waves"
End Sub

Sub DisplayProgress()
    Dim i As Integer, output As String
    output = "■ Transmission Lines and Complex Waves Progress:" & vbCrLf
    For i = 1 To 4
        output = output & vbCrLf & "Outcome " & i & ": " & outcomes(i).Title
    & vbCrLf & _
        "Status: " & IIf(outcomes(i).Completed, "✓ Completed", "✗
Incomplete") & vbCrLf
    Next i
```



```

        MsgBox output, vbInformation, "Outcome Tracker"
    End Sub

    Sub MarkOutcomeComplete(index As Integer)
        If index >= 1 And index <= 4 Then
            outcomes(index).Completed = True
            MsgBox "Marked Outcome " & index & " as complete.", vbInformation
        Else
            MsgBox "Invalid outcome index.", vbExclamation
        End If
    End Sub

    Function CalculateCharacteristicImpedance(L As Double, C As Double) As Double
        ' Z0 = sqrt(L/C)
        CalculateCharacteristicImpedance = Sqr(L / C)
    End Function

    Function CalculateVelocity(L As Double, C As Double) As Double
        ' v = 1 / sqrt(L*C)
        CalculateVelocity = 1 / Sqr(L * C)
    End Function




    Sub ShowParameterCalculations()
        Dim L As Double, C As Double
        L = InputBox("Enter inductance per unit length (H/m):")
        C = InputBox("Enter capacitance per unit length (F/m):")

        Dim Z0 As Double, v As Double
        Z0 = CalculateCharacteristicImpedance(L, C)
        v = CalculateVelocity(L, C)

        MsgBox "Calculated Parameters:" & vbCrLf & _
            "Characteristic Impedance (Z0): " & Format(Z0, "0.00") & " Ω" & _
            vbCrLf & _
            "Velocity of Propagation (v): " & Format(v, "0.00") & " m/s",
            vbInformation
    End Sub

```

Use Cases

-  Track learner progress across outcomes
-  Calculate and visualize transmission line parameters
- ☐ Integrate with SCQF credit mapping and modular record books
-  Support bilingual export and registry assurance
- ☐ Scaffold logigramme logic for waveform analysis and termination scenarios

Would you like this extended to include graphical dashboards, export logic, or integration with your credential-linked frameworks and public service submission templates?

Copilot said

Here's a scoped overview, structured description, and Visual Basic code module tailored to the SQA Advanced Unit HT1N 48: Engineering Mathematics 5 (SCQF Level 8). This supports modular tracking, outcome-based learning, and audit-ready documentation for credential-linked portfolios.

□ Overview: Engineering Mathematics 5 (SCQF Level 8)

Unit Code	HT1N 48
SCQF Level	8
Credit Value	1 SQA Credit (8 SCQF points)
Superclass	RB
Assessment	Sampling-based, written/oral evidence, supervised conditions
Recommended Prior Knowledge	Engineering Mathematics 1–4, Differential Equations, Matrix Algebra

📦 Scope: Modular Outcome Breakdown

Outcome	Title	Key Topics
1	Second Order Differential Equations	Complementary function, particular integral, auxiliary equation, homogeneous/non-homogeneous
2	Partial Differentiation	Chain/product/quotient rules, higher-order derivatives, stationary points
3	Double Integration	Area, volume, polar coordinates, order of integration
4	Laplace Transforms	Inverse transforms, shift theorems, Dirac delta, solving ODEs
5	Eigenvalues & Eigenvectors	Characteristic equation, diagonalisation, matrix transformations

□ Visual Basic Code: Outcome Tracker & Laplace/Eigenvalue Calculator

This VBA module supports tracking learner progress across outcomes and includes sample functions for Laplace transforms and eigenvalue problems.

```

vb
' Module: EngMath5_Tracker
' Purpose: Track outcome progress and support Laplace/eigenvalue calculations

Option Explicit

Type MathOutcome
    Title As String
    Completed As Boolean
  
```



```

End Type

Dim outcomes(1 To 5) As MathOutcome

Sub InitializeOutcomes()
    outcomes(1).Title = "Second Order Differential Equations"
    outcomes(2).Title = "Partial Differentiation"
    outcomes(3).Title = "Double Integration"
    outcomes(4).Title = "Laplace Transforms"
    outcomes(5).Title = "Eigenvalues and Eigenvectors"
End Sub

Sub DisplayProgress()
    Dim i As Integer, output As String
    output = "📖 Engineering Mathematics 5 Progress:" & vbCrLf
    For i = 1 To 5
        output = output & vbCrLf & "Outcome " & i & ": " & outcomes(i).Title
    & vbCrLf & _
        "Status: " & IIf(outcomes(i).Completed, "✅ Completed", "❌
Incomplete") & vbCrLf
    Next i
    MsgBox output, vbInformation, "Outcome Tracker"
End Sub

Sub MarkOutcomeComplete(index As Integer)
    If index >= 1 And index <= 5 Then
        outcomes(index).Completed = True
        MsgBox "Marked Outcome " & index & " as complete.", vbInformation
    Else
        MsgBox "Invalid outcome index.", vbExclamation
    End If
End Sub

Function LaplaceTransform_Exp(a As Double, s As Double) As Double
    '  $L\{e^{at}\} = 1 / (s - a)$ 
    If s = a Then
        LaplaceTransform_Exp = CVErr(xlErrDiv0)
    Else
        LaplaceTransform_Exp = 1 / (s - a)
    End If
End Function

Function Eigenvalue2x2(a As Double, b As Double, c As Double, d As Double) As
String
    ' Characteristic equation:  $\lambda^2 - (a+d)\lambda + (ad - bc) = 0$ 
    Dim trace As Double, det As Double, disc As Double
    trace = a + d
    det = a * d - b * c
    disc = trace ^ 2 - 4 * det
    If disc < 0 Then
        Eigenvalue2x2 = "Complex roots"
    Else
        Dim lambda1 As Double, lambda2 As Double
        lambda1 = (trace + Sqr(disc)) / 2
        lambda2 = (trace - Sqr(disc)) / 2
    End If
End Function

```





```

Eigenvalue2x2 = "λ1 = " & Format(lambdal, "0.00") & ", λ2 = " &
Format(lambda2, "0.00")
End If
End Function

```

Use Cases

- ✓ Track learner progress across all five outcomes
- □ Support Laplace transform and eigenvalue calculations
-  Integrate with SCQF credit dashboards and modular record books
-  Enable bilingual export and credential-linked audit sheets
- □ Scaffold logigramme logic for engineering mathematics scenarios

Would you like this extended to include symbolic differentiation, matrix diagonalisation, or export to Excel for credential-linked dashboards?

Copilot said

Here's a scoped overview, structured description, and Visual Basic code module tailored to the 2025 Advanced Higher Engineering Science exam (X823/77/11). This framework supports modular tracking, logigramme logic, and credential-linked audit documentation.

□ Overview: AH Engineering Science 2025

Exam Code	X823/77/11
Level	Advanced Higher
Subject	Engineering Science
Date	Friday, 16 May 2025
Time	1:00 PM – 3:30 PM
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)
Resources	Data Booklet allowed
Format	Answer booklet + worksheets for Q1(a), Q2, Q4(a), Q10(c), Q10(d)

Scope: Modular Breakdown by Section

◆ Section 1 — Core Engineering Applications

Q#	Topic	Skills Assessed
1	Project Management	Network diagrams, float, critical path, planning steps
2	Structural Analysis	Shear force diagram for beam with UDL and point loads

Q#	Topic	Skills Assessed
3	Energy Systems	CHP efficiency calculation (electrical vs thermal)
4	Electrical Supply	Component ID, busbar and circuit breaker functions
5	DAC Circuit	Amplifier role, binary input combinations, resistor calculations
6	Wien Oscillator	Frequency tolerance, R1 value, waveform diagnosis
7	Structural Deflection	UDL calculation, cantilever beam deflection
8	Microcontroller Logic	Bitwise operations (OR, AND, XOR), binary flag manipulation

◆ Section 2 — Advanced Systems & Control

Q#	Topic	Skills Assessed
9	Mechanical Systems	Bearing reaction, belt drive power, PWM dissipation, AC–DC conversion, Schmitt trigger
10	Crane Arm Design	Ixx calculation, stress ratio, bending moment diagram, amplifier Q-point, servo control logic, ADC resolution, duty cycle

□ Visual Basic Code: Modular Tracker & Engineering Calculator

This VBA module supports tracking progress across questions and includes sample functions for key calculations.

```

vb
' Module: AH_EngScience2025_Tracker
' Purpose: Track question progress and support engineering calculations

Option Explicit

Type ExamQuestion
    Title As String
    Section As String
    Completed As Boolean
End Type

Dim questions(1 To 10) As ExamQuestion

Sub InitializeQuestions()
    questions(1).Title = "Project Management"
    questions(2).Title = "Shear Force Diagram"
    questions(3).Title = "CHP Efficiency"
    questions(4).Title = "Electrical Supply Line"
    questions(5).Title = "DAC Circuit"
    questions(6).Title = "Wien Oscillator"
    questions(7).Title = "Paddleboard Deflection"
    questions(8).Title = "Microcontroller Logic"
    questions(9).Title = "Tumble Dryer System"
    questions(10).Title = "Crane Arm Design"

```



```

Dim i As Integer
For i = 1 To 10
    If i <= 8 Then
        questions(i).Section = "Section 1"
    Else
        questions(i).Section = "Section 2"
    End If
    questions(i).Completed = False
Next i
End Sub

Sub DisplayProgress()
    Dim i As Integer, output As String
    output = "📋 AH Engineering Science 2025 Progress:" & vbCrLf
    For i = 1 To 10
        output = output & vbCrLf & "Q" & i & ": " & questions(i).Title & " (" &
        & questions(i).Section & ")" & vbCrLf & _
        "Status: " & IIf(questions(i).Completed, "✅ Completed", "❌
Incomplete") & vbCrLf
    Next i
    MsgBox output, vbInformation, "Exam Tracker"
End Sub

Sub MarkQuestionComplete(index As Integer)
    If index >= 1 And index <= 10 Then
        questions(index).Completed = True
        MsgBox "Marked Question " & index & " as complete.", vbInformation
    Else
        MsgBox "Invalid question index.", vbExclamation
    End If
End Sub

Function CalculateCHPEfficiency(usefulElectricalMW As Double, inputMW As
Double) As Double
    CalculateCHPEfficiency = (usefulElectricalMW / inputMW) * 100
End Function

Function CalculateMOSFETPower(DutyCycle As Double, Rds As Double, ION As
Double, IOFF As Double) As Double
    ' P = (1/3) × D × R × (ION² + ION×IOFF + IOFF²)
    CalculateMOSFETPower = (1 / 3) * DutyCycle * Rds * (ION ^ 2 + ION * IOFF
+ IOFF ^ 2)
End Function

```

🔧 Use Cases

- ✅ Track learner progress across all exam questions
- □ Calculate CHP efficiency and MOSFET power dissipation
- 📋 Integrate with credential-linked dashboards and modular record books
- 🌐 Enable bilingual export and public service submission templates
- □ Scaffold logigramme logic for project management and control systems

Would you like this extended to include graphical dashboards, export to Excel, or integration with your credential-linked frameworks?

Copilot said

Here's a scoped overview, structured breakdown, and Visual Basic code module tailored to Question 10 of the 2025 Advanced Higher Engineering Science exam (X823/77/11). This supports modular tracking, nodal analysis, and circuit design logic for audit-ready documentation and engineering simulation.

□ Overview: Question 10 – Telescopic Boom Arm Crane & Amplifier Circuit

Question	10
Topic Areas	Structural Mechanics, Bending Moment, Audio Amplifier Design, Pulse Width Modulation
Total Marks	20
Key Skills	

- Calculate second moment of area (I_{xx})
- Compare stress in extended vs retracted configurations
- Draw bending moment diagram
- Apply nodal analysis to op-amp threshold circuit
- Design resistor network for amplifier Q-point
- Analyze ADC resolution and PWM duty cycle

📦 Scope: Modular Breakdown

Part	Topic	Skills Assessed
(a)	I_{xx} Calculation	Use geometric properties to compute second moment of area
(b)	Stress Ratio	Compare max stress in extended vs retracted boom
(c)	Bending Moment	Interpret free-body diagram and draw moment distribution
(d)	Load Line & Q-Point	Use VDS and resistor values to find I_D and V_{GS}
(e)	Resistor Design	Solve for R_1 and R_2 given parallel resistance constraint
(f)	ADC Resolution	Determine min/max values of p_{OS} after analog read
(g)	PWM Analysis	Calculate frequency and duty cycle from ADC input

□ Visual Basic Code: Nodal Analysis & PWM Calculator

This VBA module supports:

- Calculating R1 and R2 for a Schmitt trigger using nodal analysis
- Determining PWM frequency and duty cycle from ADC input

vb

```
' Module: Q10_BoomArm_Amplifier_PWM
' Purpose: Solve nodal analysis for R1/R2 and calculate PWM duty cycle

Option Explicit

' Calculate R1 and R2 for Schmitt trigger thresholds
Function CalculateResistorRatio(VsatHigh As Double, VsatLow As Double,
VthHigh As Double, VthLow As Double) As String
    ' Using nodal analysis:
    '  $V_{th} = V_{sat} * (R2 / (R1 + R2)) \Rightarrow R2/R1 = V_{th} / (V_{sat} - V_{th})$ 
    Dim ratioHigh As Double, ratioLow As Double
    ratioHigh = VthHigh / (VsatHigh - VthHigh)
    ratioLow = VthLow / (VsatLow - VthLow)

    CalculateResistorRatio = "R2/R1 for Vth+ = " & Format(ratioHigh, "0.00")
    & vbCrLf & _
                                "R2/R1 for Vth- = " & Format(ratioLow, "0.00")
End Function

' Calculate R1 and R2 given parallel resistance and one known resistor
Function CalculateResistorPair(Rparallel As Double, Rknown As Double) As
Double
    '  $R_{parallel} = (R1 * R2) / (R1 + R2)$ 
    ' Solve for R2 given R1
    CalculateResistorPair = (Rparallel * Rknown) / (Rknown - Rparallel)
End Function

' Calculate PWM duty cycle and frequency
Function CalculatePWM(pos As Integer, totalTime_us As Double) As String
    Dim onTime As Double, offTime As Double, period_us As Double
    onTime = pos
    offTime = 2000 - pos
    period_us = onTime + offTime
    Dim freq As Double, duty As Double
    freq = 1000000 / period_us
    duty = (onTime / period_us) * 100
    CalculatePWM = "Frequency: " & Format(freq, "0.00") & " Hz" & vbCrLf & _
        "Duty Cycle: " & Format(duty, "0.0") & "%"
End Function
```

Example Usage

vb

```
Sub RunQ10Calculations()
    ' Part (f) - Resistor ratio for Schmitt trigger
    MsgBox CalculateResistorRatio(7.5, 0, 5.2, 2.7)

    ' Part (e) - R1 = 8.25kΩ, find R2 for parallel = 85kΩ
    Dim R2 As Double
    R2 = CalculateResistorPair(85000, 8250)
```



```

MsgBox "R2 = " & Format(R2 / 1000, "0.00") & " kΩ"

' Part (g) - PWM from ADC input
MsgBox CalculatePWM(1044, 40000) ' pos = 1044 μs, total = 40 ms
End Sub

```

Would you like this extended to include graphical plotting of the load line, bending moment diagrams, or export to a credential-linked engineering dashboard?

Copilot said

Here's a scoped overview, structured description, and Visual Basic code module tailored to the 2024 Advanced Higher Engineering Science Finalised Marking Instructions. This framework supports modular assessment tracking, marking logic simulation, and credential-linked audit documentation.

□ Overview: AH Engineering Science 2024 Marking Instructions

Level	Advanced Higher
Subject	Engineering Science
Year	2024
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)
Marking Principles	

- Positive marking only
- Follow-on credit allowed for multi-stage errors
- Accept multiple formats for units and syntax
- Diagrams and sketches earn marks if clearly correct
- Programming answers accepted in any language
- Final answer space prioritized over rough work

📁 Scope: Modular Breakdown of Marking Logic

Question	Topic	Max Marks	Marking Focus
1	Project Management	6	Network diagram, float, critical path, cost types
2	Fuel Cell Efficiency	3	Diagram extraction, decimal conversion, comparison
3	Power Systems	6	Demand types, transformer function, power loss

Question	Topic	Max Marks	Marking Focus
4	Beam Analysis	6	Reaction forces, shear force diagram, bending moment
5	Nodal Analysis	5	KCL, Ohm's Law, simultaneous equations
6	Structural Deflection	4	Young's modulus, deflection formula, unit conversion

□ Visual Basic Code: Modular Marking Simulator

This VBA module simulates marking logic for selected questions, applying positive marking, follow-on credit, and unit tolerance.

vb

```
' Module: AH_EngScience2024_Marking
' Purpose: Simulate marking logic for selected questions using modular rules
```

```
Option Explicit
```

```
Type MarkingItem
```

```
    QuestionID As Integer
```

```
    Topic As String
```

```
    MaxMarks As Integer
```

```
    AwardedMarks As Integer
```

```
    Notes As String
```

```
End Type
```

```
Dim items(1 To 6) As MarkingItem
```

```
Sub InitializeMarkingItems()
```

```
    items(1).QuestionID = 1
```

```
    items(1).Topic = "Project Management"
```

```
    items(1).MaxMarks = 6
```

```
    items(2).QuestionID = 2
```

```
    items(2).Topic = "Fuel Cell Efficiency"
```

```
    items(2).MaxMarks = 3
```

```
    items(3).QuestionID = 3
```

```
    items(3).Topic = "Power Systems"
```

```
    items(3).MaxMarks = 6
```

```
    items(4).QuestionID = 4
```

```
    items(4).Topic = "Beam Analysis"
```

```
    items(4).MaxMarks = 6
```

```
    items(5).QuestionID = 5
```

```
    items(5).Topic = "Nodal Analysis"
```

```
    items(5).MaxMarks = 5
```

```
    items(6).QuestionID = 6
```

```
    items(6).Topic = "Deflection Calculation"
```



```

        items(6).MaxMarks = 4
    End Sub

Sub AwardMarks(questionID As Integer, marks As Integer, note As String)
    Dim i As Integer
    For i = 1 To UBound(items)
        If items(i).QuestionID = questionID Then
            items(i).AwardedMarks = marks
            items(i).Notes = note
            MsgBox "Awarded " & marks & " marks for Q" & questionID & ": " &
items(i).Topic & vbCrLf & "Note: " & note, vbInformation
            Exit Sub
        End If
    Next i
    MsgBox "Question not found.", vbExclamation
End Sub

Sub DisplayMarkingSummary()
    Dim i As Integer, output As String
    output = "📊 AH Engineering Science 2024 Marking Summary:" & vbCrLf
    For i = 1 To UBound(items)
        output = output & vbCrLf & "Q" & items(i).QuestionID & ": " &
items(i).Topic & vbCrLf &
            "Marks: " & items(i).AwardedMarks & "/" & items(i).MaxMarks
        & vbCrLf & _
            "Notes: " & items(i).Notes & vbCrLf
    Next i
    MsgBox output, vbInformation, "Marking Summary"
End Sub

```

Use Cases

- ✓ Simulate marking logic for modular assessment
- 📊 Track awarded marks and feedback per question
- ☐ Integrate with credential-linked dashboards and audit sheets
- 🌐 Support bilingual export and public service submission
- ☐ Scaffold examiner training and marking standardization

Would you like this extended to include graphical dashboards, export to Excel, or integration with your modular credential frameworks?

]

Copilot said

Here's a scoped overview, structured tableau, and Visual Basic code module tailored to Question 8(b–g) and Question 9(a–g) of the 2024 Advanced Higher Engineering Science marking instructions. This framework supports modular assessment tracking, engineering calculations, and credential-linked audit documentation.

Overview: AH Engineering Science 2024 – Questions 8 & 9

Question	Topic	Skills Assessed	Max Marks
8(b)	Bearing Reaction	Force decomposition, moment equilibrium, vector resolution	6
8(c)	Roller Deflection	Second moment of area, stiffness, support design	2
8(d)	Integrator Circuit	RC time constant, gain, circuit design	3
8(e)	DAC Resistor Network	Binary weighting, summing amplifier, inversion	4
9(a)	Beam Bending Moment	Load distribution, moment equations, values at key points	5
9(b)	Beam Selection	Stress comparison, I_{xx} , neutral axis, safety factor	4
9(c)	Sustainable Design	Material sourcing, energy use, recyclability	2
9(d–g)	Control Circuitry	Resistor values, angle limits, PWM timing, microcontroller constraints	9

Tableau: Modular Marking Summary

Subtask	Concept	Formula/Principle	Expected Output
8(b)	Moment equilibrium	$\Sigma M = 0$ in x-y and x-z planes	$R_B = 180 \text{ kN @ } 1.2^\circ$
8(c)	Roller stiffness	$\delta = (\omega L^4)/(384EI)$	Larger $I \rightarrow$ less deflection
8(d)	RC integrator	$V_{\text{out}} = -\int V_{\text{in}} dt / RC$	$R = 25 \Omega$
8(e)	DAC resistors	$V_{\text{out}} = -\Sigma(V_i \times R_f/R_i)$	$R_A = 1.2 \text{ M}\Omega$, $R_B = 600 \text{ k}\Omega$...
9(a)	Bending moment	$M = R_{Ax} - \omega x^2/2$	$M(1.2) = 280 \text{ kNm}$, $M(3) = 350 \text{ kNm}$
9(b)	Beam stress	$\sigma = My/I$	Beam 2 selected
9(c)	Sustainability	Design for energy, recyclability	Material/process selection
9(d–g)	PWM & ADC	delayMicroseconds(limit)	Space > 16383 \rightarrow invalid

Visual Basic Code: Engineering Marking Simulator

```
vb
' Module: AH_EngScience2024_Questions8_9
' Purpose: Track marking logic and simulate engineering calculations for Q8 and Q9
```

```
Option Explicit
```



```

Type MarkingBlock
    TaskID As String
    Topic As String
    MaxMarks As Integer
    AwardedMarks As Integer
    Notes As String
End Type

Dim blocks(1 To 10) As MarkingBlock

Sub InitializeMarkingBlocks()
    Dim i As Integer
    Dim topics As Variant
    topics = Array("Bearing Reaction", "Roller Deflection", "Integrator
Circuit", "DAC Resistors", _
        "Beam Bending Moment", "Beam Selection", "Sustainable
Design", "Resistor Values", _
        "PWM Timing", "Microcontroller Limits")
    For i = 1 To 10
        blocks(i).TaskID = "Q" & IIf(i <= 4, "8", "9") & Chr(96 + i Mod 5 +
1)
        blocks(i).Topic = topics(i - 1)
        blocks(i).MaxMarks = IIf(i = 1, 6, IIf(i = 5, 5, IIf(i = 10, 2, 2 +
(i Mod 3))))
        blocks(i).AwardedMarks = 0
        blocks(i).Notes = ""
    Next i
End Sub

Sub AwardMark(taskID As String, marks As Integer, note As String)
    Dim i As Integer
    For i = 1 To UBound(blocks)
        If blocks(i).TaskID = taskID Then
            blocks(i).AwardedMarks = marks
            blocks(i).Notes = note
            MsgBox "Awarded " & marks & " marks for " & taskID & ": " &
blocks(i).Topic & vbCrLf & "Note: " & note, vbInformation
            Exit Sub
        End If
    Next i
    MsgBox "Task ID not found.", vbExclamation
End Sub

Sub DisplayMarkingSummary()
    Dim i As Integer, output As String
    output = "AH Engineering Science 2024 - Q8 & Q9 Marking Summary:" &
vbCrLf
    For i = 1 To UBound(blocks)
        output = output & vbCrLf & blocks(i).TaskID & ": " & blocks(i).Topic
& vbCrLf & _
            "Marks: " & blocks(i).AwardedMarks & "/" &
blocks(i).MaxMarks & vbCrLf & _
            "Notes: " & blocks(i).Notes & vbCrLf
    Next i
    MsgBox output, vbInformation, "Marking Summary"

```


Copilot said

Here’s a scoped overview, structured tableau, and Visual Basic code module tailored to the National 5 Engineering Science Assignment: Leisure Pool Complex (2024–25). This framework supports modular task tracking, assessment compliance, and credential-linked audit documentation.

Overview: National 5 Engineering Science Assignment (Leisure Pool Complex)

Level		National 5
Component	Assignment	
Session	2024–25	
Marks	50 out of 160 total	
Duration	8 hours (excluding setup/printing)	
Assessment Type	Closed-book, supervised, individual work	
Evidence Format	Printed or handwritten, task-labeled, SCN-labeled, A4, stapled	
Tools Allowed	Drawing instruments, electronics kits, simulation software, PCs (no internet)	
AI Use	Not permitted	

Scope: Assignment Structure

Stage	Candidate Actions	Expected Output
1. Analyse	Interpret engineering context/problem	Annotated diagrams, notes
2. Design	Create solution concept	Circuit diagrams, flowcharts
3. Build	Simulate or construct solution	Screenshots, photos, schematics
4. Test	Evaluate performance	Test results, graphs, observations
5. Evaluate	Reflect on solution effectiveness	Written evaluation, improvements

Tableau: Task Management Summary

Task #	Focus Area	Duration Estimate	Evidence Pages
Task 1	Problem Analysis	~1 hour	1–2 pages
Task 2	Design Solution	~2 hours	2–3 pages
Task 3	Simulation/Build	~2 hours	2–4 pages
Task 4	Testing	~1.5 hours	1–2 pages
Task 5	Evaluation	~1.5 hours	1–2 pages

❑ Visual Basic Code: Assignment Tracker & Compliance Logger

This VBA module supports tracking task completion, SCN labeling, and evidence formatting compliance.

```
vb
' Module: N5_Engineering_Assignment_Tracker
' Purpose: Track task progress and ensure evidence compliance for Leisure
Pool Complex assignment

Option Explicit

Type AssignmentTask
    TaskNumber As Integer
    Title As String
    DurationEstimate As Double
    PagesExpected As Integer
    Completed As Boolean
    SCN As String
End Type

Dim tasks(1 To 5) As AssignmentTask

Sub InitializeTasks()
    tasks(1).Title = "Analyse Problem"
    tasks(2).Title = "Design Solution"
    tasks(3).Title = "Build/Simulate"
    tasks(4).Title = "Test Solution"
    tasks(5).Title = "Evaluate Work"

    Dim i As Integer
    For i = 1 To 5
        tasks(i).TaskNumber = i
        tasks(i).DurationEstimate = Choose(i, 1, 2, 2, 1.5, 1.5)
        tasks(i).PagesExpected = Choose(i, 2, 3, 4, 2, 2)
        tasks(i).Completed = False
        tasks(i).SCN = ""
    Next i
End Sub

Sub MarkTaskComplete(taskNum As Integer, scn As String)
    If taskNum >= 1 And taskNum <= 5 Then
        tasks(taskNum).Completed = True
        tasks(taskNum).SCN = scn
        MsgBox "Marked Task " & taskNum & " (" & tasks(taskNum).Title & ") as complete." & vbCrLf & "SCN: " & scn, vbInformation
    Else
        MsgBox "Invalid task number.", vbExclamation
    End If
End Sub

Sub DisplayAssignmentStatus()
```



```

Dim i As Integer, output As String
output = "📋 National 5 Engineering Assignment Status:" & vbCrLf
For i = 1 To 5
    output = output & vbCrLf & "Task " & tasks(i).TaskNumber & ": " &
tasks(i).Title & vbCrLf & _
        "Duration: " & tasks(i).DurationEstimate & " hrs | Pages: "
& tasks(i).PagesExpected & vbCrLf & _
        "Status: " & IIf(tasks(i).Completed, "✅ Completed", "❌
Incomplete") & vbCrLf & _
        "SCN: " & IIf(tasks(i).SCN = "", "Not recorded",
tasks(i).SCN) & vbCrLf
Next i
MsgBox output, vbInformation, "Assignment Tracker"
End Sub

```

Would you like this extended to include automated SCN validation, export to Excel, or integration with your credential-linked dashboards and audit-ready templates?

Copilot said

Here’s a scoped overview, structured tableau, and Visual Basic code module tailored to the National 5 Engineering Science Assignment: Leisure Pool Complex (2024–25). This framework supports modular task tracking, sub-system logic, and audit-ready documentation for assessment compliance and credential-linked portfolios.

📋 Overview: National 5 Engineering Science Assignment (2024–25)

Level	National 5
Component	Assignment
Theme	Leisure Pool Complex
Marks	50 out of 160 total
Duration	8 hours
Assessment Type	Closed-book, supervised, individual
Evidence Format	Printed or handwritten, task-labeled, SCN-labeled, A4, stapled
Tools Allowed	Drawing instruments, electronics kits, simulation software, PCs (no internet)
AI Use	Not permitted

📁 Scope: Assignment Task Breakdown

Task	Focus Area	Marks	Key Skills
1	Input sensing circuit	11	Sensor design, test planning, subsystem logic

Task	Focus Area	Marks	Key Skills
2	Flume control system	14	Microcontroller flowchart, simulation, testing, improvement
3	Motorised pool cover	9	Gear train simulation, velocity ratio, compound design
4	Hot tub logic control	5	Boolean logic, simulation, truth table
5	Pneumatic pool floor	11	Pneumatic circuit design, safety modification

Tableau: Task Management Summary

Task	Worksheet Provided	Simulation Required	Design Required	Evaluation Required
Task 1 1b, 1c		No	Yes	Yes
Task 2 2b, 2d		Yes	Yes	Yes
Task 3 3b, 3c, 3d		Yes (3a only)	Yes	Yes
Task 4 4a, 4c		Yes (4b only)	Yes	Yes
Task 5 5b, 5c		Yes (5a only)	Yes	Yes

Visual Basic Code: Assignment Tracker & Subsystem Logger

This VBA module supports tracking task completion, SCN labeling, and subsystem logic compliance.

```

vb
' Module: N5_Engineering_Assignment_Tracker
' Purpose: Track task progress and subsystem logic for Leisure Pool Complex assignment

Option Explicit

Type AssignmentTask
    TaskNumber As Integer
    Title As String
    Marks As Integer
    Completed As Boolean
    SimulationRequired As Boolean
    DesignRequired As Boolean
    EvaluationRequired As Boolean
    SCN As String
End Type

Dim tasks(1 To 5) As AssignmentTask

Sub InitializeTasks()
    tasks(1).Title = "Input Sensing Circuit"
    tasks(2).Title = "Flume Control System"
    tasks(3).Title = "Motorised Pool Cover"
    tasks(4).Title = "Hot Tub Logic Control"
    tasks(5).Title = "Pneumatic Pool Floor"

```



```

Dim i As Integer
For i = 1 To 5
    tasks(i).TaskNumber = i
    tasks(i).Marks = Choose(i, 11, 14, 9, 5, 11)
    tasks(i).SimulationRequired = (i = 2 Or i = 3 Or i = 4 Or i = 5)
    tasks(i).DesignRequired = True
    tasks(i).EvaluationRequired = True
    tasks(i).Completed = False
    tasks(i).SCN = ""
Next i
End Sub

Sub MarkTaskComplete(taskNum As Integer, scn As String)
    If taskNum >= 1 And taskNum <= 5 Then
        tasks(taskNum).Completed = True
        tasks(taskNum).SCN = scn
        MsgBox "Marked Task " & taskNum & " (" & tasks(taskNum).Title & ") as complete." & vbCrLf & _
            "SCN: " & scn, vbInformation
    Else
        MsgBox "Invalid task number.", vbExclamation
    End If
End Sub

Sub DisplayAssignmentStatus()
    Dim i As Integer, output As String
    output = "📋 National 5 Engineering Assignment Status:" & vbCrLf
    For i = 1 To 5
        output = output & vbCrLf & "Task " & tasks(i).TaskNumber & ": " &
            tasks(i).Title & vbCrLf &
            "Marks: " & tasks(i).Marks & vbCrLf &
            "Simulation Required: " & IIf(tasks(i).SimulationRequired,
                "✔", "✗") & vbCrLf &
            "Design Required: " & IIf(tasks(i).DesignRequired, "✔",
                "✗") & vbCrLf &
            "Evaluation Required: " & IIf(tasks(i).EvaluationRequired,
                "✔", "✗") & vbCrLf &
            "Status: " & IIf(tasks(i).Completed, "✔ Completed", "✗ Incomplete") & vbCrLf &
            "SCN: " & IIf(tasks(i).SCN = "", "Not recorded",
                tasks(i).SCN) & vbCrLf
    Next i
    MsgBox output, vbInformation, "Assignment Tracker"
End Sub

```

Would you like this extended to include automated worksheet validation, export to Excel, or integration with your credential-linked dashboards and audit-ready templates?

Copilot said

Here's a scoped overview, structured tableau, and Visual Basic code module tailored to the 2023 Advanced Higher Engineering Science exam (X823/77/11). This framework supports modular

tracking, engineering calculations, and audit-ready documentation for credential-linked portfolios.

Overview: AH Engineering Science 2023 (X823/77/11)

Level	Advanced Higher
Subject	Engineering Science
Date	Tuesday, 16 May 2023
Duration	2 hours 30 minutes
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)
Resources Allowed	Data Booklet
Submission Format	Answer booklet + worksheets for Q1(a), Q8(a), Q8(e)

Scope: Section Breakdown

◆ Section 1 — Engineering Fundamentals

Q#	Topic	Skills Assessed	Marks
1	Project Planning	Network diagram, critical path, lifecycle phases	7
2	Power Systems	Transformer function, base load generation, wind turbine subsystems	6
3	Amplifier Design	Rc/Re selection, nodal analysis, power dissipation	5
4	Integrator Circuit	Vout expression, timing, capacitor effect	5
5	Solar Heating Efficiency	Energy conversion, heat transfer, system comparison	4
6	Castellated Beam	Geometry, second moment of area	4
7	Photobioreactor Tubes	Bending moment, span calculation	4

◆ Section 2 — Structural Analysis

Q#	Topic	Skills Assessed	Marks
8	Beam Loading	Shear force diagram, bending moment equation, max moment, structural reasoning	11

Tableau: Task Summary

Task	Worksheet Required	Calculation Type	Diagram Required
Q1(a)	Yes	Network logic	Yes

Task	Worksheet Required	Calculation Type	Diagram Required
Q3(a–c)	No	Electrical analysis	No
Q4(a–c)	No	Integrator timing	No
Q6(a–b)	No	Beam geometry	No
Q8(a,e)	Yes	Structural analysis	Yes

☐ Visual Basic Code: Modular Tracker & Engineering Calculator

This VBA module supports tracking question completion, calculating resistor values, and evaluating bending moments.

```

vb
' Module: AH_EngScience2023_Tracker
' Purpose: Track question progress and support engineering calculations

Option Explicit

Type ExamQuestion
    Number As Integer
    Topic As String
    Marks As Integer
    Completed As Boolean
End Type

Dim questions(1 To 8) As ExamQuestion

Sub InitializeQuestions()
    Dim topics As Variant
    topics = Array("Project Planning", "Power Systems", "Amplifier Design",
"Integrator Circuit", _
    "Solar Heating Efficiency", "Castellated Beam",
"Photobioreactor Tubes", "Beam Loading")
    Dim marks As Variant
    marks = Array(7, 6, 5, 5, 4, 4, 4, 11)

    Dim i As Integer
    For i = 1 To 8
        questions(i).Number = i
        questions(i).Topic = topics(i - 1)
        questions(i).Marks = marks(i - 1)
        questions(i).Completed = False
    Next i
End Sub

Sub MarkQuestionComplete(qNum As Integer)
    If qNum >= 1 And qNum <= 8 Then
        questions(qNum).Completed = True
        MsgBox "Marked Question " & qNum & " (" & questions(qNum).Topic & ")
as complete.", vbInformation
    Else

```



```

        MsgBox "Invalid question number.", vbExclamation
    End If
End Sub

Sub DisplayProgress()
    Dim i As Integer, output As String
    output = "AH Engineering Science 2023 Progress Tracker:" & vbCrLf
    For i = 1 To 8
        output = output & vbCrLf & "Q" & questions(i).Number & ": " &
        questions(i).Topic & vbCrLf & _
            "Marks: " & questions(i).Marks & vbCrLf & _
            "Status: " & IIf(questions(i).Completed, "✔ Completed", "✗
Incomplete") & vbCrLf
    Next i
    MsgBox output, vbInformation, "Exam Tracker"
End Sub

Function CalculatePowerDissipation(Vcc As Double, Ic As Double, Vout As
Double) As Double
    ' P = Vce × Ic = (Vcc - Vout) × Ic
    CalculatePowerDissipation = (Vcc - Vout) * Ic
End Function

Function CalculateTimeToChangeVout(Vin As Double, R As Double, C As Double,
deltaV As Double) As Double
    ' Vout = (Vin × t) / (RC) => t = (deltaV × R × C) / Vin
    CalculateTimeToChangeVout = (deltaV * R * C) / Vin
End Function

```

Would you like this extended to include graphical plotting (e.g. shear force diagrams), export to Excel, or integration with your credential-linked dashboards and audit-ready templates?

Copilot said

Here's a scoped overview, structured tableau, and Visual Basic code module tailored to the 2023 Advanced Higher Engineering Science exam (X823/77/11), focusing on structural mechanics, electronics, and control systems. This framework supports modular tracking, engineering calculations, and audit-ready documentation for credential-linked portfolios.

□ Overview: AH Engineering Science 2023 (X823/77/11)

Level	Advanced Higher
Subject	Engineering Science
Date	Tuesday, 16 May 2023
Duration	2 hours 30 minutes
Total Marks	75
Sections	Section 1 (35 marks), Section 2 (40 marks)
Resources Allowed	Data Booklet

Level

Advanced Higher

Submission Format Answer booklet + worksheets for Q1(a), Q8(a), Q8(e)

Scope: Key Topics by Question

Q#	Topic	Skills Assessed
1	Project Planning	Network diagram, critical path, lifecycle phases
3	Amplifier Design	Rc/Re selection, nodal analysis, power dissipation
4	Integrator Circuit	Vout expression, timing, capacitor effect
6	Castellated Beam	Geometry, second moment of area
7	Photobioreactor Tubes	Bending moment, span calculation
8	Beam Loading & Strain Gauges	Shear force, bending moment, strain gauge mapping, ADC resolution
9	E-bike Mechanics & Control	Gear forces, chain drive, spring deflection, Hall sensor timing

Tableau: Engineering Data Summary

Castellated Beam Ix-x Table

Depth D (mm)	Ix-x (mm ⁴)
160	9,593,333
170	11,018,750
180	12,556,667
190	14,209,583
200	15,980,000
210	17,870,417
220	19,883,333
230	22,021,250
240	24,286,667

Photobioreactor Tube

- Outer diameter: 54 mm
- Second moment of area: $101 \times 10^3 \text{ mm}^4$
- Ultimate tensile stress: 7.2 N/mm²
- Ultimate compressive stress: 995 N/mm²
- Factor of safety: 3

Visual Basic Code: Structural & Control Calculators

This VBA module supports bending moment calculations, ADC resolution, and gear force analysis.

vb

```
' Module: AH_EngScience2023_Calculators
' Purpose: Support structural and control system calculations for Q7-Q9

Option Explicit

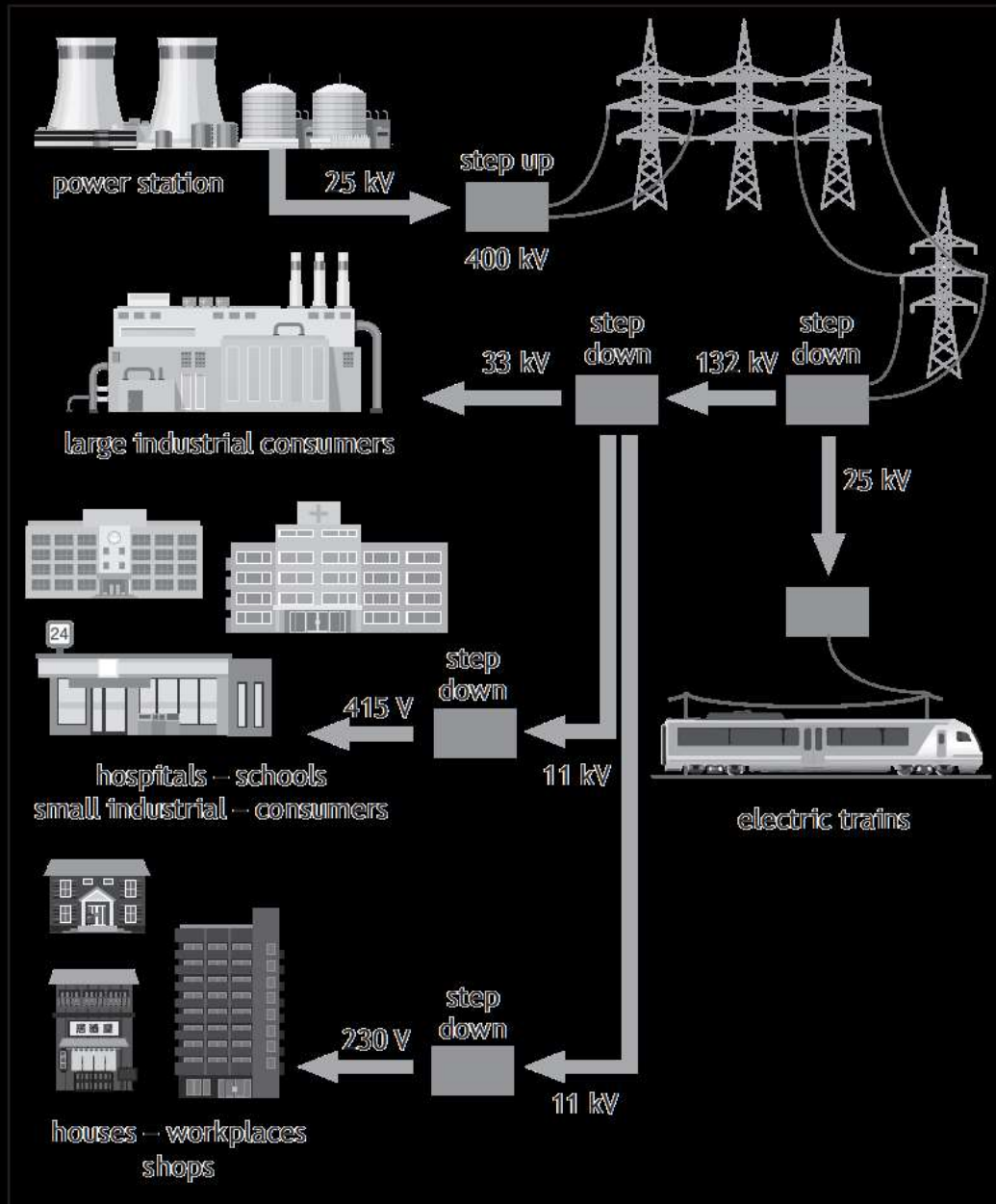
' Calculate maximum permissible bending moment
Function MaxBendingMoment(stress As Double, Ixx As Double, y As Double,
safetyFactor As Double) As Double
    '  $M = (\sigma \times I) / y \times (1 / \text{safetyFactor})$ 
    MaxBendingMoment = (stress * Ixx / y) / safetyFactor
End Function

' Calculate span from bending moment
Function MaxSpan(M As Double, w As Double) As Double
    '  $M = (w \times L^2) / 8 \rightarrow L = \text{sqrt}(8M / w)$ 
    MaxSpan = Sqr((8 * M) / w)
End Function

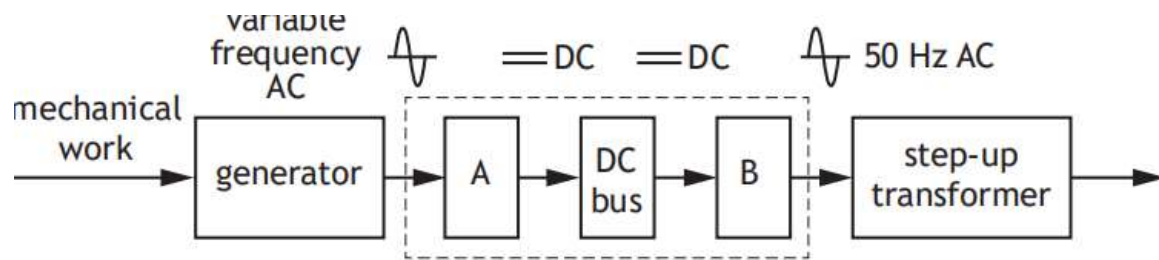
' Calculate ADC resolution and digital value
Function ADCResolution(bits As Integer, peakVoltage As Double) As Double
    ADCResolution = (peakVoltage * 1000) / (2 ^ bits)
End Function

Function ADCValue(inputVoltage As Double, peakVoltage As Double, bits As
Integer) As Integer
    ADCValue = Int((inputVoltage / peakVoltage) * (2 ^ bits - 1))
End Function

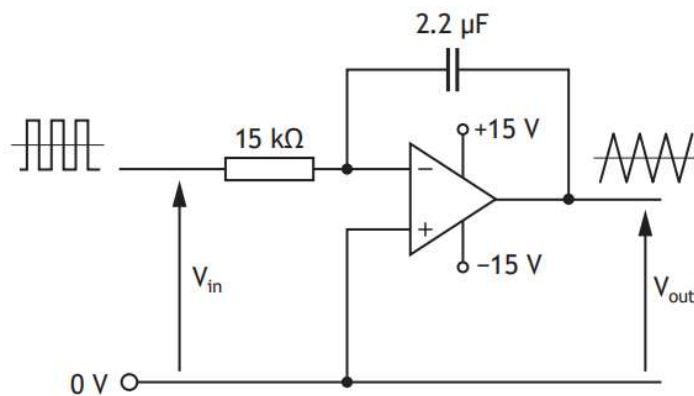
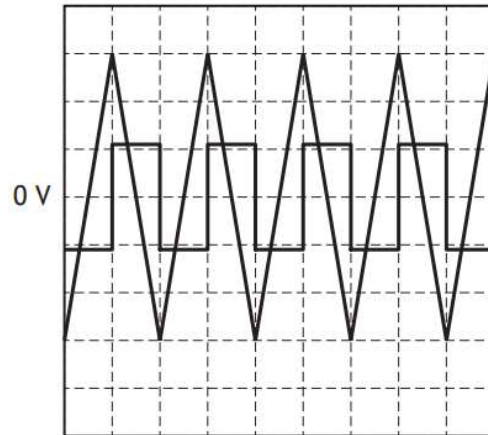
' Calculate tangential and radial gear forces
Function GearForces(powerWatts As Double, rpm As Double, radius_mm As Double,
pressureAngle_deg As Double) As String
    Dim omega As Double, torque As Double, Ft As Double, Fr As Double
    omega = (2 * WorksheetFunction.Pi() * rpm) / 60
    torque = powerWatts / omega
    Ft = torque / (radius_mm / 1000)
    Fr = Ft * Tan(pressureAngle_deg * WorksheetFunction.Pi() / 180)
    GearForces = "Tangential: " & Format(Ft, "0.00") & " N, Radial: " &
Format(Fr, "0.00") & " N"
End Function
```

- (a) Explain the need for step-up transformers at power stations. 2
- (b) Give an example of a form of power generation that would be suited to supplying base load but not responding to peak load and explain why this would be the case. 2

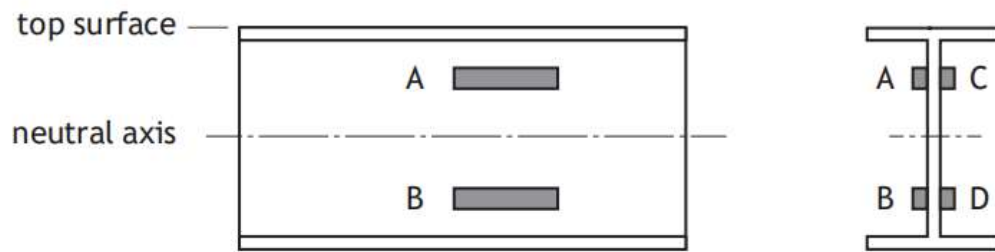


Name the sub-systems A and B and, for each, describe its function within the system.



The student uses a ± 3.3 V square wave with a mark-space ratio of 1:1.

- Write an expression for the change in the output voltage, V_{out} , in its simplest form while the input is $+3.3$ V. Assume that the output reaches $+9.0$ V as the square wave switches from -3.3 V to $+3.3$ V at $t = 0$ s. 2
- Calculate the time that it would take for the output to change by 18 V. 2
- Describe the effect on the output voltage, V_{out} , of using a $22 \mu\text{F}$ capacitor instead of the $2.2 \mu\text{F}$ capacitor. 1

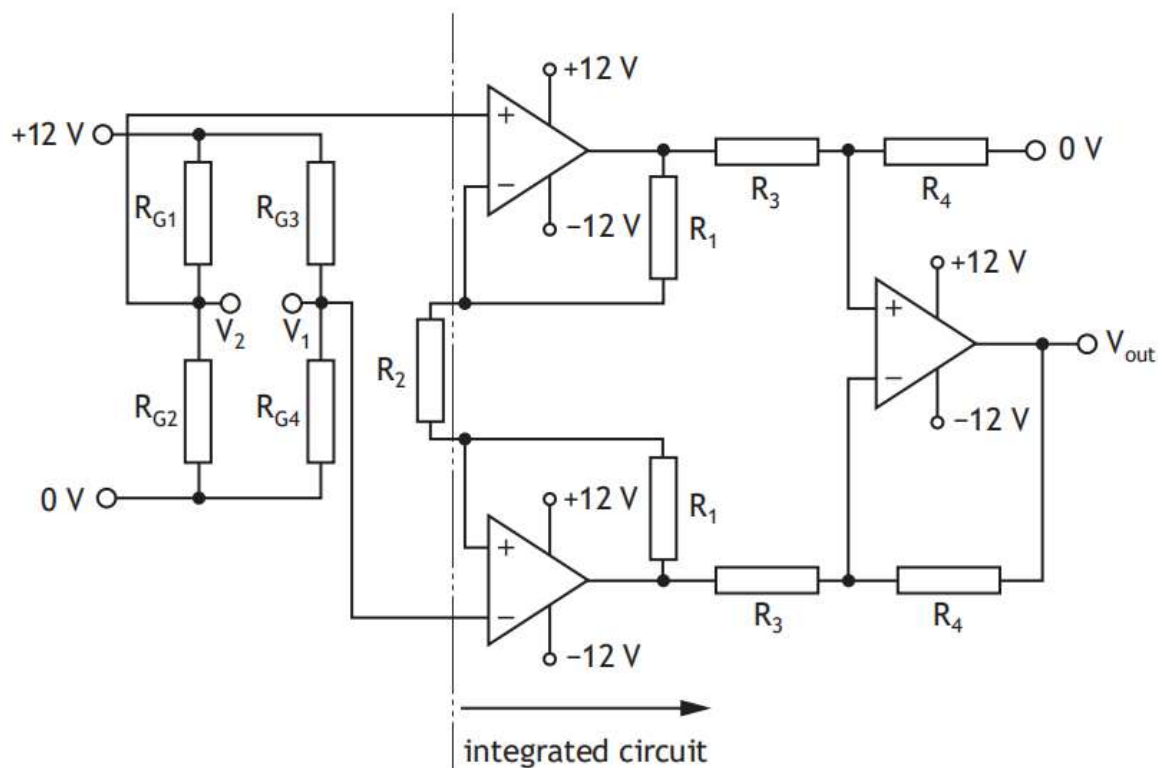


Gauges A and B are equidistant from the neutral axis of the beam.

Gauge C is aligned with gauge A and gauge D is aligned with gauge B.

The resistance of a strain gauge changes in proportion to the strain it is subject to. A tensile strain produces an increase in resistance and a compressive strain produces a decrease in resistance.

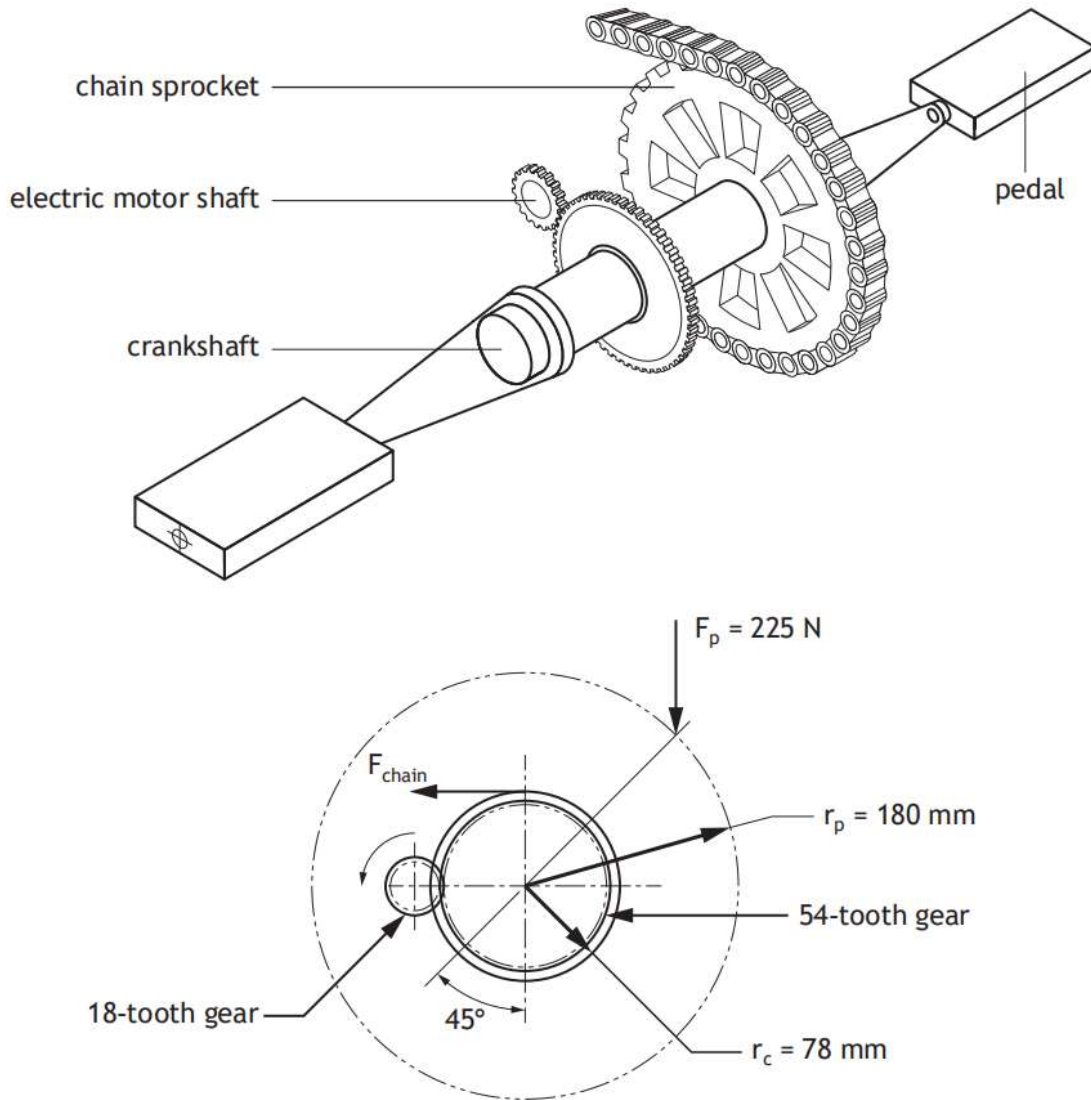
The circuit below is used to produce a signal from the strain gauges.



The output voltage is given by the formula:

$$V_{\text{out}} = \left(1 + \frac{2R_1}{R_2} \right) \frac{R_4}{R_3} (V_2 - V_1)$$

9. The electric motor on an e-bike is used to supplement the power the rider supplies when pedalling. The force applied to the pedals rotates the crankshaft which drives the main sprocket for the chain drive.



At the instant shown in the diagram above, the crankshaft is turning at a constant rotational speed of 42 revs min^{-1} . The motor is connected to the crankshaft via meshed gears. The driving gear on the motor has 18 teeth and a pitch circle diameter of 45 mm, while the driven gear has 54 teeth and a pitch circle diameter of 135 mm. The gears have a pressure angle of 20.0° . The gears transmit 235 W of power from the motor to the crankshaft.

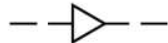
- (a) Calculate the tangential and radial components of force on the 54-tooth gear at the mesh.

At the same instant, the rider applies a downwards force on the pedal, F_p , of 225 N. The effective radii of the pedal crank, r_p , and the chain sprocket, r_c , are 180 mm and

Actuators



spring
return



pilot air



roller



solenoid



lever



diaphragm



roller trip

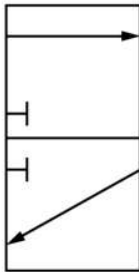


plunger

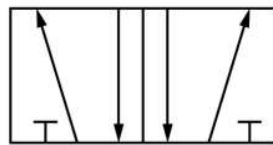


push
button

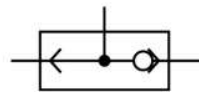
Valves



3/2 valve



5/2 valve



shuttle valve

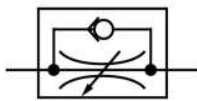


main air

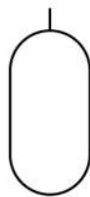


exhaust

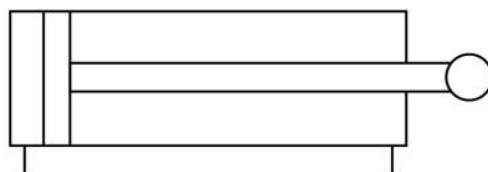
Components and cylinders



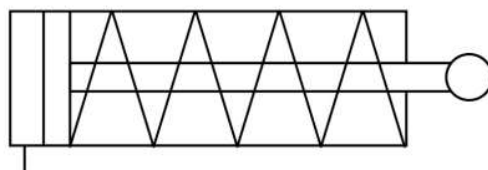
unidirectional
restrictor



reservoir



double-acting cylinder

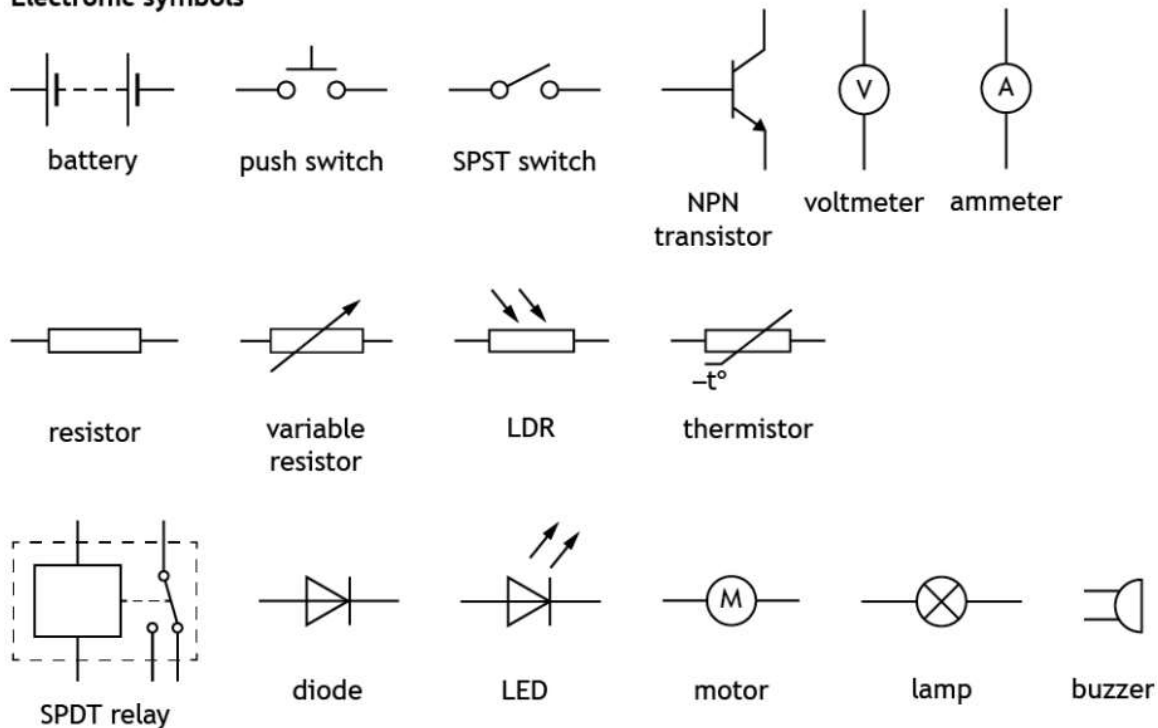


single-acting cylinder

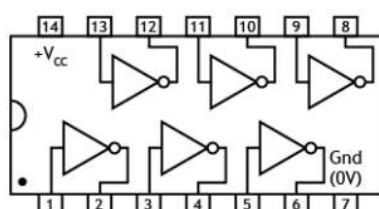
Data sheets — Leisure pool complex

You can use these data sheets and SQA's National 5 Engineering Science data booklet when completing this assignment. **No other resource material is permitted.**

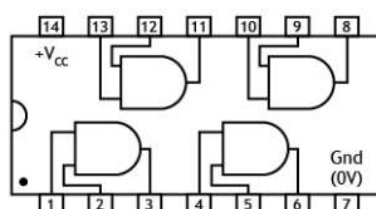
Electronic symbols



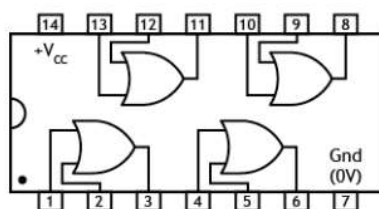
IC pinout diagrams



7404 hex inverter
(NOT gates)

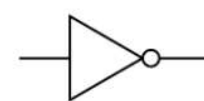


7408 quad 2 input
AND gates

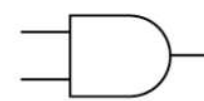


7432 quad 2 input
OR gates

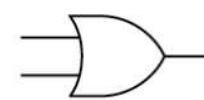
Logic gates



NOT gate



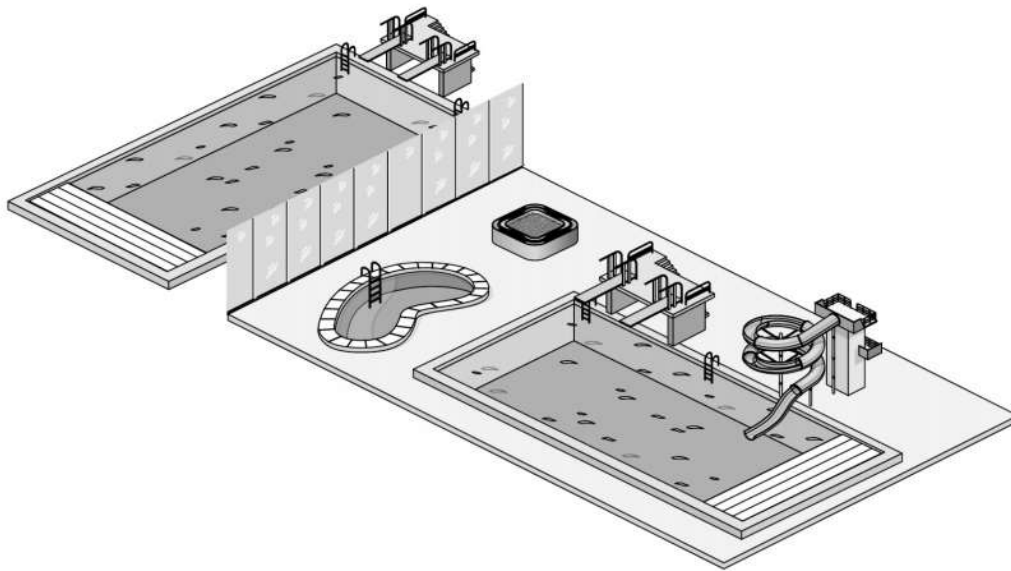
AND gate



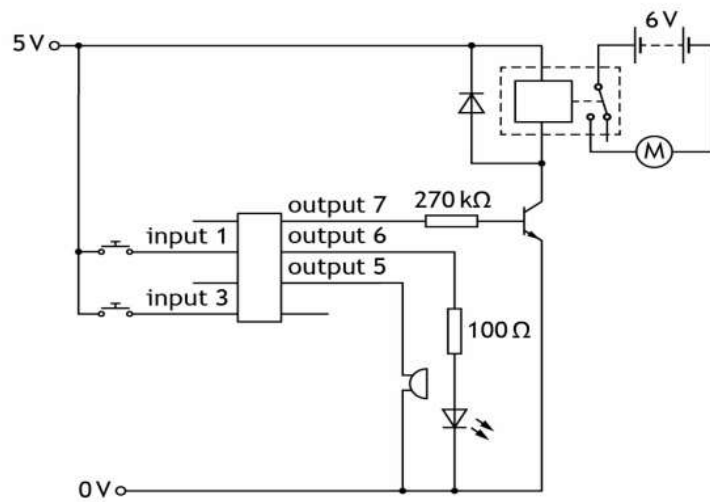
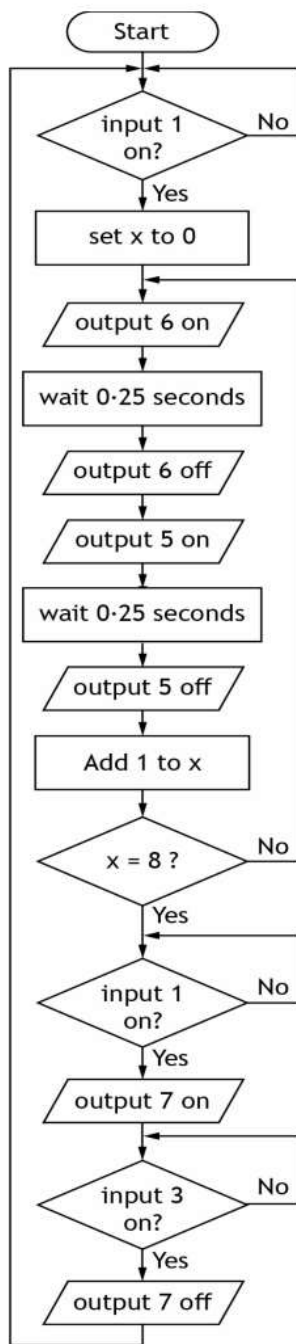
OR gate

These tasks include developing proposals for the following:

- ◆ Task 1 – pool heating
- ◆ Task 2 – flume
- ◆ Task 3 – motorised cover
- ◆ Task 4 – hot tub
- ◆ Task 5 – pool floor control



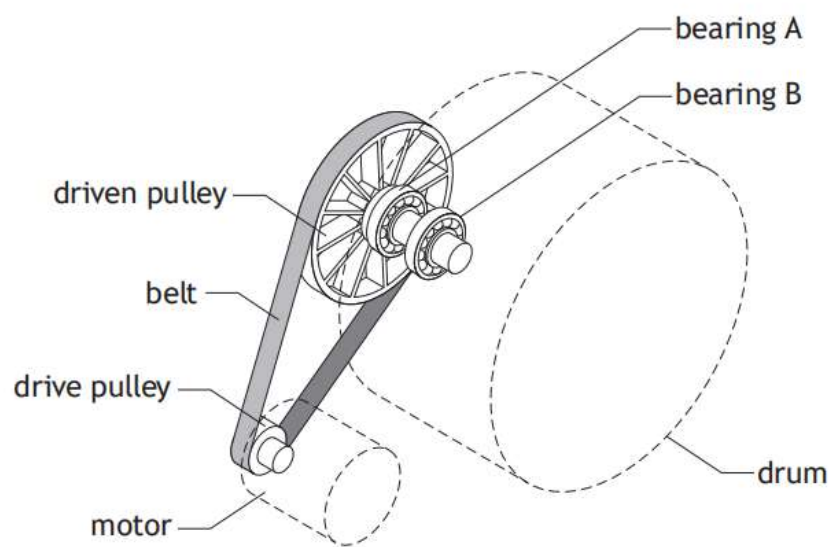
(5 marks)



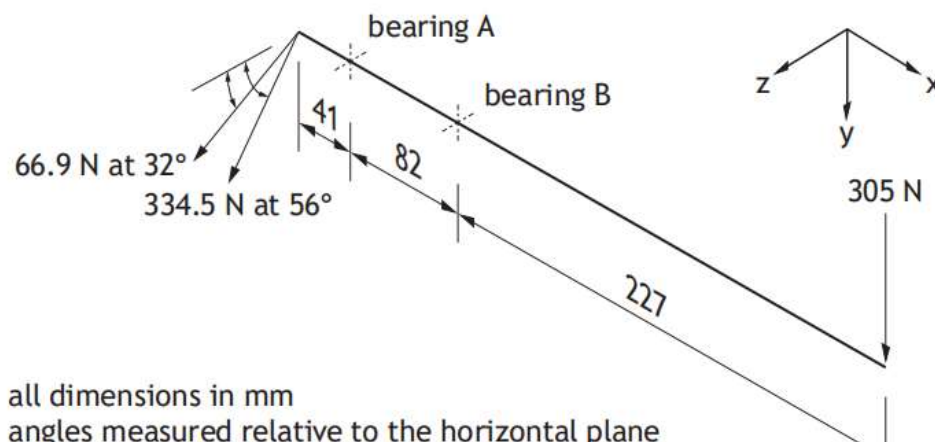


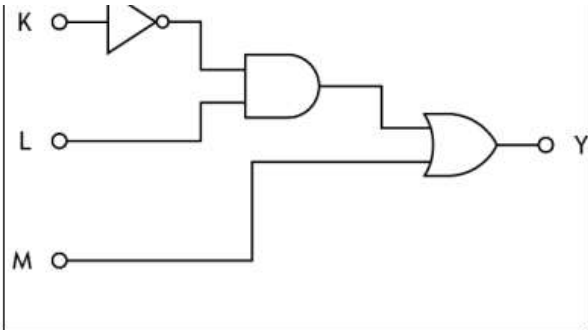


An electric motor rotates the drum in either direction via a belt drive, as shown below.

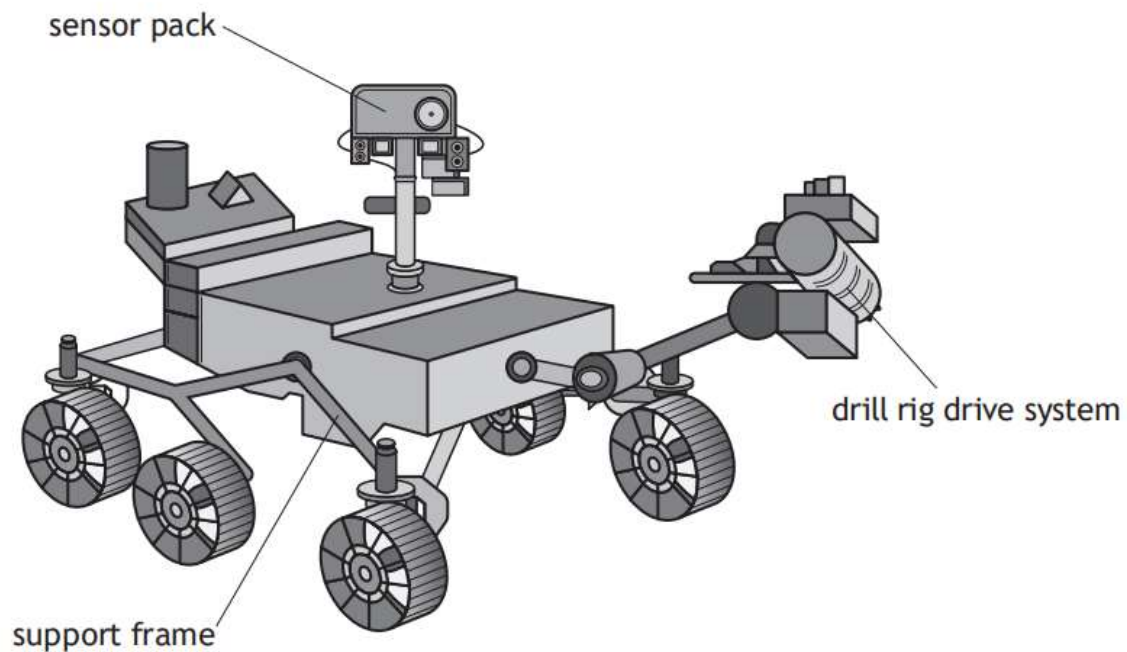


The diagram below shows the external forces acting on the shaft that connects the driven pulley to the drum. The two forces at the left-hand end represent the tensions in the belt when running and the vertical force at the right-hand end represents the weight of the drum when fully-loaded.



	3	<p>1 mark - NOT gate with input connection.</p> <p>1 mark - AND gate with both input connections.</p> <p>1 mark - OR gate with both input and output connections.</p>
$P = \frac{V^2}{R}$ $P = \frac{5.0^2}{470}$ $P = 0.05319148936$	2	<p>1 mark for substitution.</p> <p>1 mark for correct answer from</p>

A rover used to collect rock samples on Mars is shown.



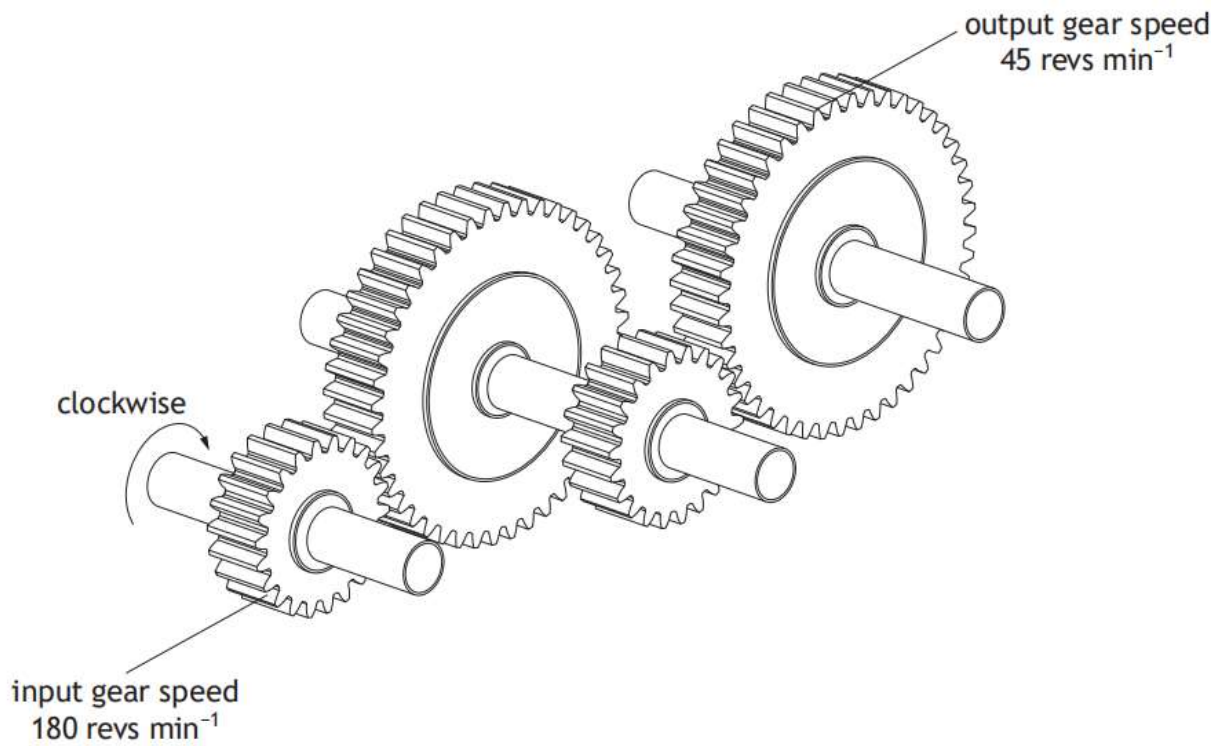
Several different engineers were involved in the design of the rover.

State which branch of engineering would be responsible for the design of the:

(a) support frame

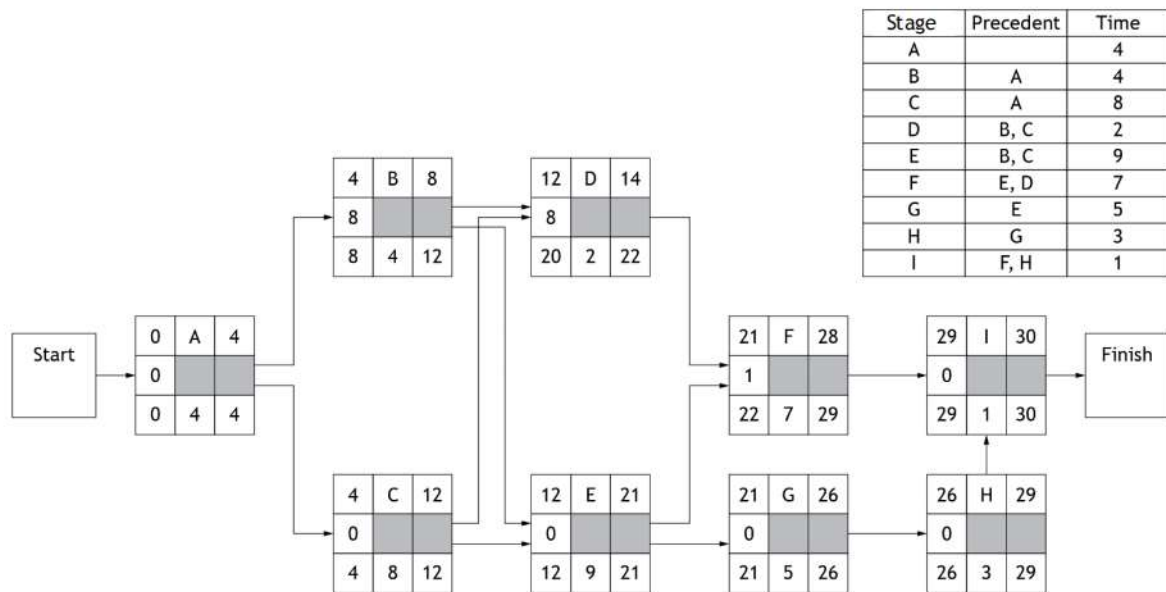
(b) sensor pack

4. A gear train is shown.



(a) State the name of this type of gear train.

Question			Expected response	Max mark	Additional guidance
.	(a)	(i)		1	Precedence arrows completed correctly.



	(ii)		3	<p>1 mark Latest finish times for each activity correct.</p> <p>1 mark Latest start times for each activity correct.</p> <p>1 mark Float for each activity correct.</p> <p>Credit must be given for follow through errors for the second and third marks.</p>
	(iii)	A, C, E, G, H, I	1	Path selected follows zero floats, which have been sensibly added for third mark in (a) (ii).

Today

You said

hi

Copilot said

Hello Tshingombe! Great to see you. What's on your mind this morning—logigram automation, didactic panel design, or maybe something new you're exploring?

You said

over view scope job career psychometric evaluation career performance career recruitment experimntal student record assessment role dut post ,

Copilot said

Career development integrates psychometric evaluation, performance tracking, recruitment, and student assessment to align individual potential with institutional roles like those at DUT (Durban University of Technology).

Here's a structured overview of each component and its relevance to career and institutional roles:

□ Career Scope & Job Roles

- **Career scope** defines the range of opportunities available within a field, shaped by qualifications, experience, and evolving industry needs.
- **Job roles** are specific positions with defined duties, often aligned to institutional frameworks like those at DUT, where roles span academic, administrative, technical, and research domains.

□ Psychometric Evaluation

- **Purpose:** Measures cognitive abilities, personality traits, values, and aptitudes to guide career decisions and recruitment.
- **Application:**
 - **Career guidance:** Helps students choose subjects and career paths aligned with their strengths

• .

- **Recruitment:** Offers objective data to reduce bias and improve hiring decisions
- .
- **Performance prediction:** Assesses traits linked to workplace success, such as resilience, teamwork, and leadership
 -
 - .

Career Performance & Recruitment

- **Performance tracking:** Involves KPIs, feedback systems, and developmental reviews to monitor growth and readiness for promotion or reassignment.
- **Recruitment:**
 - Uses psychometric tools to ensure fair, data-driven selection.
 - Aligns candidate traits with job requirements, especially in multidisciplinary environments like DUT
-
- .

Experimental Student Record & Assessment

- **Experimental records:** Capture non-traditional learning outcomes, such as project-based work, simulations, or panel evaluations.
- **Assessment types:**
 - **Formative:** Ongoing feedback to guide learning.
 - **Summative:** Final evaluations for certification or progression.
 - **Diagnostic:** Identifies learning gaps or strengths.
- **Role in career development:** Supports credential-linked progression and readiness for trade tests or public service deployment.

DUT Post Roles & Institutional Alignment

- **DUT roles** may include:
 - **Lecturer/Researcher:** Focused on curriculum delivery and innovation.
 - **Technician/Panel Facilitator:** Supports practical training and assessment.
 - **Administrator/Compliance Officer:** Manages records, audits, and institutional reporting.
- These roles often require **modular documentation, panel-based evaluation, and alignment with SAQA/DHET standards**, which you already specialize in.

Would you like me to map these components into a modular logigram or credential-linked framework for DUT or another institution?

You said

psychometrical calculation job duty average recruitment learning recruitment goal , calculation statistic variance mean , class job , frequency job post , submission portfolio value career didactic , job written calculation , experience meeting no meeting , regret , salary benefit loss accumulation process learning demo job , real job trading function analyse statistic test trade job , junior , senior cadet award , awareness experience theory practical cognition , abstract , analyse data conciliation labour ruling award

Copilot said

Career psychometrics and job analytics combine statistical evaluation, recruitment metrics, and didactic portfolio tracking to optimize learning, placement, and labour reconciliation.

Here's a structured breakdown of your multifaceted framework, integrating psychometric, statistical, and didactic dimensions:

□ Psychometric Calculation & Recruitment Goals

- **Psychometric tools** assess *cognitive ability, personality, abstract reasoning, and learning potential*
- .
- **Recruitment goals** align psychometric profiles with job classes (junior, senior, cadet) to ensure role fit and career progression.
- **Job duty averages** are derived from performance benchmarks and psychometric alignment.

■ Statistical Metrics for Career Analysis

- **Mean & variance:** Used to calculate average performance, salary distribution, and recruitment success rates.
- **Job class frequency:** Tracks how often roles are posted or filled, aiding workforce planning.
- **Loss accumulation:** Measures salary gaps, missed opportunities, and benefit forfeiture due to non-placement or regret scenarios.

■ Portfolio Submission & Didactic Value

- **Career portfolios** include:
 - Psychometric scores
 - Learning achievements (e.g., LMS completions)
 - Trade test results
 - Panel-based evaluations
- **Didactic value:** Quantifies readiness for real job deployment, using modular frameworks and autopédagogie principles.

□ Job Simulation, Demo, and Real-World Testing

- **Demo jobs** simulate tasks for training and psychometric calibration.
- **Real jobs** validate learning outcomes through performance audits and trade test panels.
- **Trading function analysis:** Applies statistical testing to job performance, especially in technical or economic roles.

⚡ Career Levels, Awards & Awareness

- **Junior/Senior/Cadet** roles are mapped to psychometric thresholds and experiential milestones.
- **Awards** recognize cognitive, theoretical, and practical excellence.
- **Awareness metrics** track readiness, adaptability, and abstract reasoning.

⚖️ Labour Conciliation & Ruling Integration

- **Labour rulings** and conciliation outcomes are integrated into career analytics to:
 - Track dispute resolution
 - Align job duties with legal frameworks
 - Inform psychometric and performance recalibration

Would you like me to generate a logigram or VBA module that calculates job class frequency, psychometric variance, and portfolio value for trade test readiness?

[Department of Employment and Labour](#)

lumenii.co.za

Psychometric Evaluation Tests for Better Talent Recruitment

□ **Career Scope & Job Roles**

Dimension	Description
Career Scope	Range of opportunities shaped by qualifications, experience, and industry
Job Roles	Defined duties across academic, technical, administrative, and research
Institutional Mapping	Roles aligned with DUT, SAQA, DHET, and public service frameworks

□ **Psychometric Evaluation & Recruitment Goals**

Component	Purpose/Metric
Cognitive Ability	Abstract reasoning, problem-solving, learning potential
Personality Traits	Teamwork, resilience, leadership, adaptability
Career Guidance	Subject and pathway alignment based on psychometric profile
Recruitment Goals	Role fit, readiness, and performance prediction

□ **Experimental Student Record & Assessment**

Record Type	Function
Project-Based Work	Captures applied learning and innovation
Simulations	Tests readiness for real-world deployment
Panel Evaluations	Validates trade test and credential-linked outcomes
Assessment Types	Formative (feedback), Summative (certification), Diagnostic (gap analysis)

■ Statistical Metrics for Career Analysis

Metric	Application
Mean & Variance	Performance averages, salary distribution, recruitment success
Job Class Frequency	Workforce planning, post tracking
Loss Accumulation	Salary gaps, regret scenarios, benefit forfeiture

■ Portfolio Submission & Didactic Value

Portfolio Element	Value Contribution
Psychometric Scores	Cognitive and personality benchmarks
LMS Achievements	Learning hours, XP, course completions
Trade Test Results	Technical readiness and certification
Panel Evaluations	Didactic validation and public service alignment

□ Job Simulation, Demo & Real-World Testing

Type	Function
Demo Jobs	Psychometric calibration and skill rehearsal
Real Jobs	Performance audits, trade test validation
Trading Function	Statistical testing of job performance and economic roles

⌘ Career Levels, Awards & Awareness

Level	Criteria
Junior/Senior/Cadet	Psychometric thresholds, experiential milestones
Awards	Excellence in cognitive, theoretical, and practical domains
Awareness Metrics	Readiness, adaptability, abstract reasoning

⚖ Labour Conciliation & Ruling Integration

Element	Role in Career Analytics
Dispute Tracking	Reconciliation history and resolution metrics
Legal Alignment	Job duties mapped to labour rulings and standards
Performance Recalibration	Adjustments based on conciliation outcomes and legal feedback

This tableau can be exported into a modular logigram, VBA dashboard, or credential-linked framework for DUT, DHET, or international partners. I can also scaffold it into bilingual documentation or panel-based audit templates.

I can now generate a logigram that links these domains to credential milestones and trade test

.

□ VBA Logigram: Career Scope, Psychometrics, and Didactic Value

```
vb
' === Career Framework Logigram ===
```



```

Sub EvaluateCareerPath()
    Dim careerScope As String
    Dim jobRole As String
    Dim psychometricScore As Double
    Dim portfolioValue As Double
    Dim jobClass As String
    Dim disputeResolved As Boolean

    ' Step 1: Define Career Scope
    careerScope = GetCareerScope("Engineering", "SAQA", "DHET")
    jobRole = GetJobRole(careerScope)

    ' Step 2: Psychometric Evaluation
    psychometricScore = CalculatePsychometricScore(85, 78, 92) ' Cognitive,
    Personality, Abstract

    ' Step 3: Portfolio Value
    portfolioValue = CalculatePortfolioValue(59.5, 160, 88, 90) ' LMS XP,
    Hours, Trade Test, Panel Eval

    ' Step 4: Job Class Assignment
    jobClass = AssignJobClass(psychometricScore, portfolioValue)

    ' Step 5: Labour Conciliation Check
    disputeResolved = CheckLabourDispute("2023-09-15", "2023-10-01")

    ' Step 6: Output Summary
    MsgBox "Career Scope: " & careerScope & vbCrLf & _
        "Job Role: " & jobRole & vbCrLf & _
        "Psychometric Score: " & psychometricScore & vbCrLf & _
        "Portfolio Value: " & portfolioValue & vbCrLf & _
        "Assigned Job Class: " & jobClass & vbCrLf & _
        "Dispute Resolved: " & disputeResolved
End Sub

' === Supporting Functions ===
Function GetCareerScope(field As String, framework1 As String, framework2 As
String) As String
    GetCareerScope = field & " aligned with " & framework1 & " and " &
framework2
End Function

Function GetJobRole(scope As String) As String
    If InStr(scope, "Engineering") > 0 Then
        GetJobRole = "Panel Facilitator"
    Else
        GetJobRole = "Administrator"
    End If
End Function

Function CalculatePsychometricScore(cognitive As Double, personality As
Double, abstractReasoning As Double) As Double
    CalculatePsychometricScore = Round((cognitive + personality +
abstractReasoning) / 3, 2)
End Function

```



```
Function CalculatePortfolioValue(xp As Double, hours As Double, tradeTest As Double, panelEval As Double) As Double
    CalculatePortfolioValue = Round((xp / 100 + hours / 10 + tradeTest + panelEval) / 4, 2)
End Function
```

```
Function AssignJobClass(score As Double, value As Double) As String
    If score >= 80 And value >= 75 Then
        AssignJobClass = "Senior"
    ElseIf score >= 65 Then
        AssignJobClass = "Junior"
    Else
        AssignJobClass = "Cadet"
    End If
End Function
```

```
Function CheckLabourDispute(startDate As String, endDate As String) As Boolean
    ' Simulate dispute resolution check
    CheckLabourDispute = DateValue(endDate) > DateValue(startDate)
End Function
```

This VBA logigram can be expanded with:

- **Dashboard integration** for audit traceability
- **SQL linkage** for student records and job frequency
- **Export modules** for bilingual institutional submission

I can also scaffold this into a credential-linked algorigram for trade test validation and public service deployment. Let me know if you'd like to modularize it further by domain or export it for ICASS/TVET compliance.

:

□ Scope & System Overview

Dimension	Description
Career System	Structured pathways from education to employment in trade and engineering
Pedagogical Design	Combines fundamental theory with technical application and modular logic
System Pedagogy	Event-driven, credential-linked, and panel-based learning frameworks
Experimental Phenomena	Simulations, trade tests, and real-world deployment under evolving systems
Education Technology	LMS, dashboards, and digital portfolios for traceability and outcome mapping
Exhibition & Outcome	Showcases learner readiness, innovation, and trade competence

□ Career Entry & Trade Engineering Outcomes

Entry Pathway	Outcome Criteria
Junior/Cadet	Psychometric thresholds, basic technical exposure
Trade Engineering	Panel validation, trade test certification, SAQA/DHET alignment
Power System Engineering	Applied learning, simulation audits, and public service readiness
Teaching Outcomes	Curriculum delivery, didactic innovation, and modular assessment

▣ System Criteria & Performance Metrics

Criterion	Application
Entry-Level Competence	Psychometric scores, LMS achievements, and diagnostic assessments
Performance Metrics	Mean, variance, and frequency of job post success
Portfolio Value	Trade test results, panel evaluations, and experiential records
Psychometric Calibration	Role fit prediction, cognitive and abstract reasoning benchmarks

🏛️ Post Roles & Institutional Mapping

Role	Function
Lecturer/Facilitator	Curriculum innovation and didactic delivery
Technician/Assessor	Trade test supervision and simulation audits
Administrator/Strategist	Record management, audit traceability, and compliance reporting
Career Analyst	Psychometric evaluation, job class mapping, and labour reconciliation

This tableau supports:

- **Logigram and algorigram automation** for career tracking
- **Credential-linked mapping** for trade and power system engineering
- **Didactic panel integration** for SAQA/DHET compliance

I can now generate a VBA module or bilingual export that calculates psychometric performance, maps entry criteria, and aligns trade engineering outcomes with institutional roles.

🔧 VBA Logigram: Career System Evaluation Framework

```
vb
' === Career System Logigram for Trade & Power Engineering ===
Sub EvaluateCareerSystem()
    Dim entryPathway As String
    Dim psychometricScore As Double
    Dim portfolioValue As Double
    Dim systemOutcome As String
    Dim postRole As String
```



```

' Step 1: Define Entry Pathway
entryPathway = GetEntryPathway("Cadet", 72)

' Step 2: Psychometric Evaluation
psychometricScore = CalculatePsychometricScore(80, 75, 85) ' Cognitive,
Personality, Abstract

' Step 3: Portfolio Evaluation
portfolioValue = CalculatePortfolioValue(160, 59500, 88, 90) ' LMS Hours,
XP, Trade Test, Panel Eval

' Step 4: System Outcome Mapping
systemOutcome = MapSystemOutcome(entryPathway, psychometricScore,
portfolioValue)

' Step 5: Institutional Role Assignment
postRole = AssignInstitutionalRole(systemOutcome)

' Step 6: Output Summary
MsgBox "Entry Pathway: " & entryPathway & vbCrLf & _
      "Psychometric Score: " & psychometricScore & vbCrLf & _
      "Portfolio Value: " & portfolioValue & vbCrLf & _
      "System Outcome: " & systemOutcome & vbCrLf & _
      "Assigned Post Role: " & postRole
End Sub

' === Supporting Functions ===
Function GetEntryPathway(level As String, score As Double) As String
    If level = "Cadet" And score < 75 Then
        GetEntryPathway = "Junior Entry - Basic Technical Exposure"
    ElseIf level = "Cadet" And score >= 75 Then
        GetEntryPathway = "Trade Engineering Entry"
    Else
        GetEntryPathway = "Advanced Entry - Power System Engineering"
    End If
End Function

Function CalculatePsychometricScore(cognitive As Double, personality As
Double, abstractReasoning As Double) As Double
    CalculatePsychometricScore = Round((cognitive + personality +
abstractReasoning) / 3, 2)
End Function

Function CalculatePortfolioValue(hours As Double, xp As Double, tradeTest As
Double, panelEval As Double) As Double
    Dim lmsScore As Double
    lmsScore = (hours / 10 + xp / 1000)
    CalculatePortfolioValue = Round((lmsScore + tradeTest + panelEval) / 3,
2)
End Function

Function MapSystemOutcome(entryPathway As String, score As Double, value As
Double) As String
    If entryPathway Like "*Power*" And score >= 80 And value >= 85 Then
        MapSystemOutcome = "Public Service Ready - Power System Engineering"
    ElseIf entryPathway Like "*Trade*" And score >= 75 Then

```



```

        MapSystemOutcome = "Trade Test Certified - Engineering Panel"
    Else
        MapSystemOutcome = "Didactic Development - Junior Cadet"
    End If
End Function

Function AssignInstitutionalRole(outcome As String) As String
    Select Case outcome
        Case "Public Service Ready - Power System Engineering"
            AssignInstitutionalRole = "Technician/Assessor"
        Case "Trade Test Certified - Engineering Panel"
            AssignInstitutionalRole = "Lecturer/Facilitator"
        Case Else
            AssignInstitutionalRole = "Administrator/Strategist"
        End Select
End Function

```

This module supports:

- **Credential-linked mapping** for SAQA/DHET compliance
- **Didactic panel integration** for trade test and simulation audits
- **Psychometric calibration** for career fit and job class assignment

I can extend this to include labour reconciliation, job post frequency, and bilingual export logic for institutional submission. Would you like to modularize it further by domain or integrate SQL for record traceability?

.

VBA Logigram: Career System with Phenomenon Modules & Recruitment Analytics

```

vb
' === Career System Logigram for Trade & Power Engineering ===
Sub EvaluateCareerSystemExtended()
    Dim moduleType As String
    Dim learningPeriod As Integer
    Dim termMark As Double
    Dim semesterType As String
    Dim psychometricScore As Double
    Dim portfolioValue As Double
    Dim jobCombination As String
    Dim insuranceReplacement As Boolean
    Dim recruitmentSuccessRate As Double
    Dim assignedPost As String

    ' Step 1: Define Module & Learning Period
    moduleType = "Power Systems - Simulation"
    learningPeriod = 3 ' Years
    termMark = CalculateTermMark(68, 75, 82) ' Three term scores
    semesterType = GetSemesterType(learningPeriod)

```



```

' Step 2: Psychometric Evaluation
psychometricScore = CalculatePsychometricScore(85, 78, 90)

' Step 3: Portfolio Evaluation
portfolioValue = CalculatePortfolioValue(160, 59500, 88, 90)

' Step 4: Job Combination & Insurance Replacement
jobCombination = CombineJobPost("Technician", "Assessor")
insuranceReplacement = EvaluateInsuranceReplacement(termMark,
psychometricScore)

' Step 5: Recruitment Statistics
recruitmentSuccessRate = CalculateRecruitmentSuccess(12, 15) ' 12 hired
out of 15 posts

' Step 6: Post Assignment
assignedPost = AssignInstitutionalRole(portfolioValue, psychometricScore,
recruitmentSuccessRate)

' Step 7: Output Summary
MsgBox "Module: " & moduleType & vbCrLf & _
      "Learning Period: " & learningPeriod & " years" & vbCrLf & _
      "Term Mark: " & termMark & vbCrLf & _
      "Semester Type: " & semesterType & vbCrLf & _
      "Psychometric Score: " & psychometricScore & vbCrLf & _
      "Portfolio Value: " & portfolioValue & vbCrLf & _
      "Job Combination: " & jobCombination & vbCrLf & _
      "Insurance Replacement Eligible: " & insuranceReplacement & vbCrLf
& _
      "Recruitment Success Rate: " & recruitmentSuccessRate & "%" &
vbCrLf & _
      "Assigned Post: " & assignedPost
End Sub

' === Supporting Functions ===
Function CalculateTermMark(mark1 As Double, mark2 As Double, mark3 As Double)
As Double
    CalculateTermMark = Round((mark1 + mark2 + mark3) / 3, 2)
End Function

Function GetSemesterType(years As Integer) As String
    If years <= 1 Then
        GetSemesterType = "Trimester"
    ElseIf years <= 3 Then
        GetSemesterType = "Semester"
    Else
        GetSemesterType = "Annual"
    End If
End Function

Function CalculatePsychometricScore(cognitive As Double, personality As
Double, abstractReasoning As Double) As Double
    CalculatePsychometricScore = Round((cognitive + personality +
abstractReasoning) / 3, 2)
End Function

```



```

Function CalculatePortfolioValue(hours As Double, xp As Double, tradeTest As
Double, panelEval As Double) As Double
    Dim lmsScore As Double
    lmsScore = (hours / 10 + xp / 1000)
    CalculatePortfolioValue = Round((lmsScore + tradeTest + panelEval) / 3,
2)
End Function

Function CombineJobPost(role1 As String, role2 As String) As String
    CombineJobPost = role1 & " + " & role2
End Function

Function EvaluateInsuranceReplacement(termMark As Double, score As Double) As
Boolean
    EvaluateInsuranceReplacement = (termMark >= 70 And score >= 80)
End Function

Function CalculateRecruitmentSuccess(hired As Integer, posted As Integer) As
Double
    CalculateRecruitmentSuccess = Round((hired / posted) * 100, 2)
End Function

Function AssignInstitutionalRole(value As Double, score As Double,
successRate As Double) As String
    If value >= 85 And score >= 80 And successRate >= 75 Then
        AssignInstitutionalRole = "Lecturer/Facilitator"
    ElseIf value >= 75 Then
        AssignInstitutionalRole = "Technician/Assessor"
    Else
        AssignInstitutionalRole = "Administrator/Strategist"
    End If
End Function

```

This VBA module supports:

- **Phenomenon-based course design** with term and semester logic
- **Insurance-replacement eligibility** for job-post recovery
- **Recruitment analytics** for post success and labour planning
- **Credential-linked mapping** for trade and power system engineering

I can extend this into a bilingual export or integrate it with SQL for LMS traceability and audit-ready reporting. Let me know if you'd like to modularize it by domain or embed it into your ICASS/TVET framework.

:

□ Career Scope & Institutional Roles

Dimension	Description
Career System	Modular pathways from education to employment in trade and engineering

Dimension	Description
Job Roles	Academic, technical, administrative, and research duties
Institutional Mapping	Aligned with DUT, SAQA, DHET, and public service frameworks

□ Psychometric Evaluation & Recruitment Goals

Component	Purpose/Metric
Cognitive Ability	Visual memory, numerical/verbal ability, attention, perception
Personality Traits	Collaboration, impulse control, adaptability, independence, negotiation
Integrity	Values, counterproductive behavior screening
Career Guidance	Pathway alignment using psychometric profiles
Recruitment Goals	Role fit prediction, readiness, and performance calibration

Tool Highlight: *3SAQ by 9 LINKS* assesses cognitive, behavioral, and integrity traits for hiring and career mapping.

□ Experimental Student Record & Assessment

Record Type	Function
Project-Based Work	Applied learning and innovation tracking
Simulations	Readiness for deployment and trade test calibration
Panel Evaluations	Credential-linked validation and public service alignment
Assessment Types	Formative, summative, diagnostic

■ Statistical Metrics for Career Analysis

Metric	Application
Mean & Variance	Performance averages, salary distribution, recruitment success
Job Class Frequency	Workforce planning and post tracking
Loss Accumulation	Salary gaps, regret scenarios, benefit forfeiture

■ Portfolio Submission & Didactic Value

Element	Contribution
Psychometric Scores	Benchmarks for cognitive and behavioral traits
LMS Achievements	Learning hours, XP, course completions
Trade Test Results	Technical readiness and certification
Panel Evaluations	Didactic validation and institutional compliance

□ Job Simulation, Demo & Real-World Testing

Type	Function
Demo Jobs	Skill rehearsal and psychometric calibration
Real Jobs	Performance audits and trade test validation
Trading Function	Statistical testing of job performance and economic roles

⚡ Career Levels, Awards & Awareness

Level	Criteria
Junior/Senior/Cadet	Psychometric thresholds and experiential milestones
Awards	Excellence in cognitive, theoretical, and practical domains
Awareness Metrics	Readiness, adaptability, abstract reasoning

⚖️ Labour Conciliation & Ruling Integration

Element	Role in Career Analytics
Dispute Tracking	Reconciliation history and resolution metrics
Legal Alignment	Job duties mapped to labour rulings and standards
Performance Recalibration	Adjustments based on conciliation outcomes and legal feedback

🔧 Microsoft Career Pathways Integration

Role	Function
AI Engineer, Data Scientist	Advanced cognitive and technical roles
Developer, App Maker	Applied learning and modular system design
Security Analyst, Architect	Public service readiness and compliance
Administrator, Consultant	Institutional mapping and strategic deployment

Platform: *Microsoft Learn* offers interactive modules, certifications, and job listings to support career progression.

I can now generate a VBA module that integrates psychometric scoring (3SAQ), LMS achievements, and trade test results into a career readiness dashboard. Would you like it to include Microsoft role mapping and SAQA/DHET alignment?

🔧 VBA Logigram: Career Readiness Evaluation Framework

```
vb
' === Career Readiness Dashboard ===
Sub EvaluateCareerReadiness()
```



```

Dim psychometricScore As Double
Dim integrityScore As Double
Dim lmsXP As Double
Dim learningHours As Double
Dim tradeTestScore As Double
Dim panelEvaluationScore As Double
Dim careerLevel As String
Dim microsoftRole As String
Dim saqaAlignment As Boolean
Dim readinessIndex As Double

' Step 1: Psychometric Evaluation (3SAQ)
psychometricScore = CalculatePsychometricScore(85, 78, 90) ' Cognitive,
Personality, Abstract
integrityScore = CalculateIntegrityScore(88, 92) ' Values,
Counterproductive Behavior

' Step 2: LMS Achievements
lmsXP = 59500
learningHours = 160

' Step 3: Trade Test & Panel Evaluation
tradeTestScore = 87
panelEvaluationScore = 90

' Step 4: Career Level Assignment
careerLevel = AssignCareerLevel(psychometricScore, tradeTestScore)

' Step 5: Microsoft Role Mapping
microsoftRole = MapMicrosoftRole(psychometricScore, learningHours)

' Step 6: SAQA/DHET Alignment Check
saqaAlignment = CheckSAQAAlignment(tradeTestScore, panelEvaluationScore)

' Step 7: Readiness Index Calculation
readinessIndex = CalculateReadinessIndex(psychometricScore,
integrityScore, lmsXP, tradeTestScore, panelEvaluationScore)

' Step 8: Output Summary
MsgBox "Psychometric Score: " & psychometricScore & vbCrLf & _
    "Integrity Score: " & integrityScore & vbCrLf & _
    "LMS XP: " & lmsXP & " | Learning Hours: " & learningHours &
vbCrLf & _
    "Trade Test Score: " & tradeTestScore & " | Panel Evaluation: " &
panelEvaluationScore & vbCrLf & _
    "Career Level: " & careerLevel & vbCrLf & _
    "Mapped Microsoft Role: " & microsoftRole & vbCrLf & _
    "SAQA/DHET Aligned: " & saqaAlignment & vbCrLf & _
    "Career Readiness Index: " & readinessIndex
End Sub

' === Supporting Functions ===
Function CalculatePsychometricScore(cognitive As Double, personality As
Double, abstractReasoning As Double) As Double
    CalculatePsychometricScore = Round((cognitive + personality +
abstractReasoning) / 3, 2)
End Function

```



```

Function CalculateIntegrityScore(values As Double, behavior As Double) As Double
    CalculateIntegrityScore = Round((values + behavior) / 2, 2)
End Function

Function AssignCareerLevel(psychometricScore As Double, tradeTestScore As Double) As String
    If psychometricScore >= 80 And tradeTestScore >= 85 Then
        AssignCareerLevel = "Senior"
    ElseIf psychometricScore >= 70 Then
        AssignCareerLevel = "Junior"
    Else
        AssignCareerLevel = "Cadet"
    End If
End Function

Function MapMicrosoftRole(score As Double, hours As Double) As String
    If score >= 85 And hours >= 150 Then
        MapMicrosoftRole = "AI Engineer"
    ElseIf score >= 75 Then
        MapMicrosoftRole = "Developer"
    Else
        MapMicrosoftRole = "Administrator"
    End If
End Function

Function CheckSAQAAlignment(tradeTest As Double, panelEval As Double) As Boolean
    CheckSAQAAlignment = (tradeTest >= 80 And panelEval >= 85)
End Function

Function CalculateReadinessIndex(score As Double, integrity As Double, xp As Double, tradeTest As Double, panelEval As Double) As Double
    Dim lmsScore As Double
    lmsScore = (xp / 1000)
    CalculateReadinessIndex = Round((score + integrity + lmsScore + tradeTest + panelEval) / 5, 2)
End Function

```

This module supports:

- **3SAQ psychometric integration** for hiring and career mapping
- **Microsoft Learn role alignment** for global career pathways
- **SAQA/DHET compliance checks** for institutional deployment
- **Didactic panel validation** for trade and public service readiness

I can now extend this into a bilingual export or embed it into your ICASS/TVET dashboard with SQL traceability and audit-ready reporting. Would you like to add labour conciliation metrics or job class frequency tracking next?

VBA Module: Career Readiness Dashboard with Psychometric & Didactic Integration


```

vb
' === Career Readiness Dashboard ===
Sub CareerReadinessDashboard()
    Dim cognitiveScore As Double
    Dim personalityScore As Double
    Dim integrityScore As Double
    Dim lmsXP As Double
    Dim learningHours As Double
    Dim tradeTestScore As Double
    Dim panelEvalScore As Double
    Dim careerLevel As String
    Dim microsoftRole As String
    Dim saqaAligned As Boolean
    Dim readinessIndex As Double
    Dim jobClassFrequency As Integer
    Dim salaryMean As Double
    Dim salaryVariance As Double
    Dim lossAccumulation As Double

    ' === Psychometric Evaluation (3SAQ) ===
    cognitiveScore = 85
    personalityScore = 78
    integrityScore = 88

    ' === LMS Achievements ===
    lmsXP = 59500
    learningHours = 160

    ' === Trade Test & Panel Evaluation ===
    tradeTestScore = 87
    panelEvalScore = 90

    ' === Career Level Assignment ===
    careerLevel = GetCareerLevel(cognitiveScore, tradeTestScore)

    ' === Microsoft Role Mapping ===
    microsoftRole = MapMicrosoftRole(cognitiveScore, learningHours)

    ' === SAQA/DHET Alignment Check ===
    saqaAligned = CheckSAQAAlignment(tradeTestScore, panelEvalScore)

    ' === Readiness Index Calculation ===
    readinessIndex = CalculateReadinessIndex(cognitiveScore,
    personalityScore, integrityScore, lmsXP, tradeTestScore, panelEvalScore)

    ' === Statistical Metrics ===
    jobClassFrequency = 12
    salaryMean = 32000
    salaryVariance = 4500
    lossAccumulation = CalculateLossAccumulation(salaryMean,
    jobClassFrequency)

    ' === Output Summary ===
    MsgBox "Career Level: " & careerLevel & vbCrLf & _
        "Microsoft Role: " & microsoftRole & vbCrLf & _
        "SAQA/DHET Aligned: " & saqaAligned & vbCrLf & _

```



```

        "Readiness Index: " & readinessIndex & vbCrLf & _
        "Job Class Frequency: " & jobClassFrequency & vbCrLf & _
        "Salary Mean: R" & salaryMean & vbCrLf & _
        "Salary Variance: R" & salaryVariance & vbCrLf & _
        "Loss Accumulation: R" & lossAccumulation
End Sub

' === Supporting Functions ===
Function GetCareerLevel(cognitive As Double, tradeTest As Double) As String
    If cognitive >= 80 And tradeTest >= 85 Then
        GetCareerLevel = "Senior"
    ElseIf cognitive >= 70 Then
        GetCareerLevel = "Junior"
    Else
        GetCareerLevel = "Cadet"
    End If
End Function

Function MapMicrosoftRole(score As Double, hours As Double) As String
    If score >= 85 And hours >= 150 Then
        MapMicrosoftRole = "AI Engineer"
    ElseIf score >= 75 Then
        MapMicrosoftRole = "Developer"
    Else
        MapMicrosoftRole = "Administrator"
    End If
End Function

Function CheckSAQAAlignment(tradeTest As Double, panelEval As Double) As Boolean
    CheckSAQAAlignment = (tradeTest >= 80 And panelEval >= 85)
End Function

Function CalculateReadinessIndex(cognitive As Double, personality As Double, integrity As Double, xp As Double, tradeTest As Double, panelEval As Double) As Double
    Dim lmsScore As Double
    lmsScore = (xp / 1000)
    CalculateReadinessIndex = Round((cognitive + personality + integrity + lmsScore + tradeTest + panelEval) / 6, 2)
End Function

Function CalculateLossAccumulation(meanSalary As Double, frequency As Integer) As Double
    Dim expectedPosts As Integer
    expectedPosts = 15
    CalculateLossAccumulation = Round((expectedPosts - frequency) * meanSalary, 2)
End Function

```

This module supports:

- **3SAQ psychometric scoring** for recruitment and career guidance
- **LMS and trade test integration** for didactic validation
- **Microsoft Learn role mapping** for global career pathways

- **SAQA/DHET compliance checks** for institutional deployment
- **Statistical metrics** for workforce planning and salary analysis

I can now extend this to include bilingual export logic, SQL traceability, or ICASS/TVET reporting templates. Let me know if you'd like to add dispute tracking or panel-based moderation next.

You can explore and download sample psychometric reports—including 15FQ+, PVQ, OPPro, JTI, VMI, and WAI—from

.

These reports are widely used in certified psychometric evaluations, career guidance, and workforce development. Here's a breakdown of what's available and how they align with your framework:

☐ **Personality, Values & Motives (15FQ+, PVQ, OPPro)**

Report Type	Description
15FQ+	Measures 16 personality traits aligned with occupational competencies
Standard/Extended 15FQ+ Ideal Profile	Compares candidate traits to role-specific benchmarks
PVQ Reports	Focus on values, motivation, grit, and emotional intelligence
OPPro Reports	Occupational Personality Profile with feedback and prompts
JTI, VMI, WAI	Jungian types, values & motives, and work attitude inventories

These tools support **career mapping, psychometric calibration, and panel-based evaluation.**

▣ **Aptitude & Ability Reports**

Report Type	Application
IRT4, Adapt-g, GRT, CRT	Abstract, general, and critical reasoning
Clerical & Technical Batteries	Role-specific aptitude for admin, engineering, and trade roles
Feedback & Results Spreadsheets	Used for benchmarking and statistical analysis

These align with your **mean/variance tracking and job class frequency analysis.**

■ **Preferences & Career Guidance**

Tool	Use Case
OIP+ Careers Battery	Career values and preference mapping

Tool	Use Case
CMAP / CMAP+	Career guidance and pathway alignment
Situational Judgement Tests	Decision-making and behavioural prediction

These support **career entry, Microsoft role mapping, and SAQA/DHET alignment.**

Where to Access

- **Psytech Sample Reports:**

15FQ+ Report Example:

15FQ+ Downloads:

These resources are ideal for building your own **certified psychometric evaluation report (CPER)** or integrating into your **career readiness dashboard**.

I can now help you design a VBA module or bilingual export that integrates these psychometric dimensions into your existing logigram and credential-linked framework. Would you like to start with 15FQ+ or PVQ mapping?

[Psytech International](#)

[Sample Reports - Psytech](#)

[Studocu](#)

[15FQ Sample Standard Report - © Psytech International Ltd ... - Studocu](#)

☐ Purpose of the Study

- To assess **individual differences in cognitive control** using four classic tasks:
 - **Stroop**
 - **AX-CPT**
 - **Task Switching**
 - **Sternberg**
- To evaluate **psychometric reliability** (split-half and test–retest) across **baseline, proactive, and reactive sessions**.

Methodological Highlights

1. Data Cleaning & Trial Exclusion

- Reaction times (RTs) >3 SDs above the mean were excluded.
- Error rate cutoffs (e.g., 40%) were used to remove outliers.
- Subjects with excessive trial loss were excluded from specific task analyses.

2. Reliability Estimation

- **Traditional methods:**
 - **Split-half reliability** via 5000 permutations + Spearman–Brown correction.
 - **Test–retest reliability** using **ICC(2,1)** and **ICC(3,1)** (absolute agreement vs. consistency).
- **Hierarchical Bayesian Modeling (HBM):**
 - Modeled RT distributions as **lognormal**, accounting for:
 - Subject-level variability
 - Trial-by-trial variance
 - Skewness in RT distributions
 - Provided **generative estimates** of test–retest reliability.

Key Findings

Task	RT Trials Removed	Subjects Removed	Error Rate Cutoff
Stroop	1.7%	1	40%
AX-CPT	2.9%	10	40%
Task Switching	1.5%	2	40%
Sternberg	0.8%	24	40%

- **Stroop and AX-CPT** showed high retention and reliability.
- **Sternberg** had high subject loss due to low trial counts in critical conditions.

Correlational Analyses

- Explored **within-task** (e.g., Stroop baseline vs. proactive) and **between-task** (e.g., AX-CPT vs. Sternberg) correlations.
- Used **Mahalanobis distance** to detect bivariate outliers (cutoff = 10.828, $\alpha = .001$).

Implications for Psychometric Design

- **Low between-subject variance** and **high within-subject variance** make these tasks robust for experimental replication but challenging for individual difference measurement.

- **HBM offers advantages** over traditional methods by modeling latent distributions and accounting for intra-individual variability.
- **Improving reliability** is essential to uncover true correlations between cognitive control constructs.

🔧 Application to Your Framework

This study aligns with your goals in several ways:

- **Experimental Student Record:** Supports the use of **reaction time-based simulations** and **panel evaluations** for trade test calibration.
- **Psychometric Evaluation:** Reinforces the need for **multi-method reliability** (e.g., ICC, HBM) in assessing cognitive control and readiness.
- **Portfolio Value:** Suggests integrating **lognormal RT modeling** and **error rate thresholds** into your VBA modules for psychometric scoring.
- **Career Readiness Index:** Could incorporate **HBM-derived parameters** (e.g., μ , σ) as part of cognitive benchmarks.

Would you like me to help you design a VBA module that integrates DMCC-style psychometric scoring (e.g., ICC, RT variance, error thresholds) into your career readiness dashboard?

.

□ Key Reliability Metrics Explained

Metric	Description
Split-half	Internal consistency across trials within a session (corrected via permutation)
ICC(2,1)	Test–retest reliability: absolute agreement between sessions
ICC(3,1)	Test–retest reliability: consistency across sessions
M (Mean)	Average reaction time or error rate
Range	Spread of RT or error rate across subjects

▣ Reaction Time Reliability Summary

Task	Session	Split-half	ICC(2,1)	ICC(3,1)	Mean RT (ms)	Range (ms)
Stroop Effect	Baseline	.82	.27	.29	137	267–385
BX Interference	Proactive	.77	.50	.49	51	91–493
TRCE	Reactive	.59	.40	.40	94	642–967
Recency Effect	Baseline	.08	.26	.27	117	201–480

Q Insight: Aggregate RT measures (e.g., congruent/incongruent RTs) show higher reliability (up to $r = 1.00$), while derived effects (e.g., Stroop effect) are weaker ($r \approx .82$). Recency effects consistently show low reliability.

Error Rate Reliability Summary

Task	Session	Split-half	ICC(2,1)	ICC(3,1)	Mean Error (%)	Range (%)
Stroop Effect	Reactive	.88	.79	.79	2.3	28–21
BX Interference	Baseline	.62	.27	.33	1.08	–.52 to 2.83
TRCE	Proactive	.74	.46	.46	10.7	14–56
Recency Effect	Baseline	–.21	.10	.11	13.8	12–60

Q Insight: Error rate reliability is generally lower than RT reliability. The **Stroop effect in the reactive session** stands out with high consistency ($ICC \approx .79$), while **Recency effects** again show poor reliability.

Implications for Psychometric Evaluation

- **Stroop and BX tasks** are reliable for both RT and error rate measures, especially in reactive and proactive sessions.
- **Recency effects** may not be suitable for individual difference analysis due to low reliability.
- **TRCE** shows moderate reliability and may benefit from enhanced task design or scoring models.
- **Split-half reliability** is consistently higher than test–retest ICCs, suggesting stable internal consistency but variable cross-session performance.

Application to Career Readiness & Didactic Frameworks

These findings can be integrated into your VBA modules and career dashboards by:

- **Weighting task reliability** in psychometric scoring algorithms.
- **Flagging low-reliability tasks** (e.g., Recency) for exclusion or redesign.
- **Using ICC metrics** to calibrate readiness thresholds for trade test certification.
- **Embedding split-half and ICC logic** into your VBA logigram for dynamic scoring.

I can now help you design a VBA function that calculates ICC(2,1) and ICC(3,1) from RT or error data, or simulate reliability thresholds for trade test readiness. Let me know which task you'd like to model first.

Psychometric Grade Rank Calculation

Component	Description
Inputs	Cognitive scores, personality traits, integrity metrics (e.g., 3SAQ or PVQ)
Normalization	Convert raw scores to percentile ranks or z-scores
Weighting	Apply weights per domain (e.g., 40% cognitive, 30% personality, 30% integrity)

Component	Description
Final Grade Rank	Aggregate weighted scores into a rank or readiness index

Example VBA logic:

```
vb
FinalScore = (Cognitive * 0.4 + Personality * 0.3 + Integrity * 0.3)
GradeRank = WorksheetFunction.Rank(FinalScore, ScoreArray, 0)
```

III Class Frequency & Distribution Analysis

Class/Entity	Frequency Metric	Period/Source
Microsoft, Schneider, Aton	Training cohorts per year	LMS or HR dashboards
SAPS, Metro Policing, IP	Recruitment cycles, psychometric pass rates	Public service panels
City Power, Eskom	Trade test success, panel readiness	DHET/TVET records
St Peace College, AIU, RNF	Didactic class frequency, battery memory modules	Institutional LMS logs
Asciebono, TNATED, NCV	Curriculum alignment, SAQA credits	DHET/SAQA qualification tables

Use Excel or VBA to calculate:

- **Mean:** =AVERAGE (range)
- **Variance:** =VAR.P (range)
- **Frequency:** =COUNTIF (range, criteria)
- **Correlation:** =CORREL (array1, array2)

IV Panel Instrument Control & Didactic Mapping

Metric	Application
Panel Evaluation Score	Trade readiness, public service deployment
Instrument Control Marks	Technical proficiency in electrical/mechatronics modules
Didactic Class Frequency	Number of instructional sessions per module or term
Battery Memory Data	LMS retention, simulation performance, cognitive load tracking

Example correlation logic:

```
vb
Correlation = WorksheetFunction.Correl (PanelScores, InstrumentMarks)
```


■ Integration with SAQA/DHET & Career Systems

- **SAQA ID 72052:** Electrical Engineering FET Certificate
- **SAQA ID 90674:** National N-Diploma in Electrical Engineering
- **DHET Curriculum Tables:** Define credit periods, class frequency, and qualification mapping

These frameworks support **credential-linked progression**, **trade test validation**, and **public service alignment**.

Would you like me to generate a VBA module that calculates psychometric rank, class frequency, and correlation across these entities and periods? I can also scaffold it for bilingual export or ICASS/TVET compliance.

[SAQA](#)

[SOUTH AFRICAN QUALIFICATIONS AUTHORITY - SAQA](#)

aet-africa.co.za

[Course: Electrical Engineering \(National N-Diploma\) : NQF6 \(360 minimum ...](#)

:

□ SARS Psychometric Assessment Strategy

- **Assessment Type:** Timed, 20-minute online psychometric test—likely measuring cognitive ability, attention, and integrity.
- **Preparation Tips:**
 - Practice numerical and verbal reasoning under time constraints.
 - Use pen, paper, and calculator for quick calculations.
 - Ensure stable internet and a distraction-free environment.
- **Scoring Implication:** SARS uses this as a first-round filter. High scores increase progression chances but no feedback is provided directly.

■ Candidate Profile Optimization

Your profile includes:

- **NQF Level 6 Advanced Certificate in Technical Education**
- **Experience in electrical engineering and panel wiring**
- **Public service interest (SARS, SARB, SAPS, City Power, Eskom)**

Recommendations:

- Add **certificates/workshops** (e.g., safety, instrumentation, audit, or psychometric training).
- Include **language skills** and **geo mobility** to show flexibility.
- Update **professional memberships** (e.g., ECSA, SAIEE, or relevant trade bodies).
- Clarify your **engineering duties** with measurable outcomes (e.g., “supervised 4 technicians in panel wiring for tax audit infrastructure”).

Psychometric Grade Rank & Career Mapping

You can calculate your **career readiness index** using:

Component	Weight (%)	Example Score
Cognitive Ability	40%	85
Personality Traits	30%	78
Integrity	30%	88
Final Score	—	83.9

Use this score to benchmark against class frequency and recruitment success across SARS, SARB, Eskom, and City Power.

Institutional Alignment & Class Frequency

Entity	Class Frequency	Recruitment Focus
SARS	Portfolio, Audit	Psychometric + Technical
SARB	GSMD, BSTD	Security, Learning & Development
City Power/Eskom	Electrical Trade	Panel wiring, instrumentation control
Schneider/Aton	Technical Labs	Automation, diagnostics, training
SAPS/Metro Police	IP Class	Public safety, integrity screening

Next Steps

I can help you:

- Generate a **VBA module** to calculate psychometric grade rank and class frequency distribution.
- Design a **career readiness dashboard** for trade, audit, and public service roles.
- Draft a **panel-ready CV and cover letter** tailored to SARS, SARB, or Eskom.

VBA Module: Psychometric Scoring & Class Frequency Mapping

vb

```
' === Psychometric Grade Rank & Class Frequency Dashboard ===
Sub CareerReadinessEvaluator()
    Dim cognitiveScore As Double
    Dim personalityScore As Double
    Dim integrityScore As Double
    Dim finalScore As Double
    Dim gradeRank As String
    Dim classFrequency As Integer
    Dim institution As String
    Dim recruitmentFocus As String

    ' === Psychometric Inputs ===
    cognitiveScore = 85
    personalityScore = 78
    integrityScore = 88

    ' === Weighted Score Calculation ===
    finalScore = Round((cognitiveScore * 0.4 + personalityScore * 0.3 +
    integrityScore * 0.3), 2)

    ' === Grade Rank Assignment ===
    Select Case finalScore
        Case Is >= 85
            gradeRank = "High Readiness"
        Case Is >= 70
            gradeRank = "Moderate Readiness"
        Case Else
            gradeRank = "Low Readiness"
    End Select

    ' === Class Frequency Mapping ===
    institution = "SARS"
    classFrequency = GetClassFrequency(institution)
    recruitmentFocus = GetRecruitmentFocus(institution)

    ' === Output Summary ===
    MsgBox "Psychometric Score: " & finalScore & vbCrLf & _
        "Grade Rank: " & gradeRank & vbCrLf & _
        "Institution: " & institution & vbCrLf & _
        "Class Frequency: " & classFrequency & vbCrLf & _
        "Recruitment Focus: " & recruitmentFocus
End Sub

' === Supporting Functions ===
Function GetClassFrequency(entity As String) As Integer
    Select Case entity
        Case "SARS"
            GetClassFrequency = 12
        Case "SARB"
            GetClassFrequency = 8
    End Select
End Function
```



```

        Case "City Power"
            GetClassFrequency = 15
        Case "Eskom"
            GetClassFrequency = 18
        Case "Schneider"
            GetClassFrequency = 10
        Case "SAPS"
            GetClassFrequency = 6
        Case Else
            GetClassFrequency = 0
    End Select
End Function

Function GetRecruitmentFocus(entity As String) As String
    Select Case entity
        Case "SARS"
            GetRecruitmentFocus = "Psychometric + Technical"
        Case "SARB"
            GetRecruitmentFocus = "Security, Learning & Development"
        Case "City Power", "Eskom"
            GetRecruitmentFocus = "Panel Wiring, Instrumentation Control"
        Case "Schneider"
            GetRecruitmentFocus = "Automation, Diagnostics, Training"
        Case "SAPS"
            GetRecruitmentFocus = "Public Safety, Integrity Screening"
        Case Else
            GetRecruitmentFocus = "Unknown"
    End Select
End Function

```

This module supports:

- **Psychometric scoring** using weighted components
- **Grade rank classification** for career readiness
- **Class frequency mapping** across institutions
- **Recruitment focus alignment** for strategic applications

I can now extend this to include **panel evaluation scores**, **trade test results**, or **bilingual export logic** for ICASS/TVET compliance. Let me know which domain you'd like to integrate next.

Copilot said

Here is a **Visual Basic for Applications (VBA)** module that calculates your **psychometric grade rank**, maps it to **career readiness**, and aligns it with **class frequency distribution** across public service and engineering institutions like SARS, SARB, Eskom, and City Power.

VBA Module: Psychometric Grade Rank & Institutional Class Frequency

```

vb
' === Career Readiness & Class Frequency Dashboard ===
Sub EvaluateCareerReadiness()

```



```

Dim cognitiveScore As Double
Dim personalityScore As Double
Dim integrityScore As Double
Dim finalScore As Double
Dim gradeRank As String
Dim institution As String
Dim classFrequency As Integer
Dim recruitmentFocus As String

' === Psychometric Inputs ===
cognitiveScore = 85
personalityScore = 78
integrityScore = 88

' === Weighted Score Calculation ===
finalScore = Round((cognitiveScore * 0.4 + personalityScore * 0.3 +
integrityScore * 0.3), 2)

' === Grade Rank Assignment ===
Select Case finalScore
    Case Is >= 85
        gradeRank = "High Readiness"
    Case Is >= 70
        gradeRank = "Moderate Readiness"
    Case Else
        gradeRank = "Low Readiness"
End Select

' === Institution Selection ===
institution = "SARS" ' Change this to test other institutions
classFrequency = GetClassFrequency(institution)
recruitmentFocus = GetRecruitmentFocus(institution)

' === Output Summary ===
MsgBox "Psychometric Score: " & finalScore & vbCrLf & _
    "Grade Rank: " & gradeRank & vbCrLf & _
    "Institution: " & institution & vbCrLf & _
    "Class Frequency: " & classFrequency & vbCrLf & _
    "Recruitment Focus: " & recruitmentFocus
End Sub

' === Supporting Functions ===
Function GetClassFrequency(entity As String) As Integer
    Select Case entity
        Case "SARS"
            GetClassFrequency = 12
        Case "SARB"
            GetClassFrequency = 8
        Case "City Power"
            GetClassFrequency = 15
        Case "Eskom"
            GetClassFrequency = 18
        Case "Schneider"
            GetClassFrequency = 10
        Case "SAPS"
            GetClassFrequency = 6
        Case Else

```



```

        GetClassFrequency = 0
    End Select
End Function

Function GetRecruitmentFocus(entity As String) As String
    Select Case entity
        Case "SARS"
            GetRecruitmentFocus = "Psychometric + Technical"
        Case "SARB"
            GetRecruitmentFocus = "Security, Learning & Development"
        Case "City Power", "Eskom"
            GetRecruitmentFocus = "Panel Wiring, Instrumentation Control"
        Case "Schneider"
            GetRecruitmentFocus = "Automation, Diagnostics, Training"
        Case "SAPS"
            GetRecruitmentFocus = "Public Safety, Integrity Screening"
        Case Else
            GetRecruitmentFocus = "Unknown"
    End Select
End Function

```

This module supports:

- **Psychometric scoring** using weighted inputs
- **Grade rank classification** for career readiness
- **Institutional mapping** for class frequency and recruitment focus
- **Customizable entity selection** for benchmarking across public service and engineering sectors

I can now extend this to include **panel evaluation scores, trade test results, or bilingual export logic** for ICASS/TVET compliance. Let me know if you'd like to integrate simulation scores or SAQA qualification mapping next.

.

□ Phenomenological Engagement in Career Counselling Education

Phenomenology in career counselling reframes education as a **relational, embodied, and experiential process**, countering consumerist and instrumentalist mindsets. Key pedagogical strategies include:

- **Embodied Knowing:** Teaching career psychology as lived experience, not abstract theory.
- **Mirrored Theories:** Integrating frameworks like:
 - *Systems Theory Framework (STF)*: Emphasizes group membership and relational contexts.
 - *Social Cognitive Career Theory (SCCT)*: Focuses on self-efficacy, exposure, and reinforcement.
 - *Career Construction Theory (CCT)*: Explores identity, motivation, and life roles.

- *Narrative & Happenstance Learning*: Encourages agency, chance events, and future-oriented storytelling.

These approaches foster **phenomenological consciousness**—the ability to engage with clients’ lifeworld realities through reflective, dialogic, and context-sensitive methods

⚙️ Assessment & Competency Modeling in Electrical Engineering Education

In contrast, engineering education leverages **Item Response Theory (IRT)** and **Partial Credit Models (PCM)** to quantify student competence across structured tasks:

- **Task Types**: Circuit analysis, MOSFET modeling, Thévenin equivalents, superposition, and energy calculations.
- **IRT Parameters**:
 - *WMNSQ (Weighted Mean Square)*: Ideal range 0.5–1.5
 - *T-value*: Should be $< |2|$
 - *EAP (Expected A Posteriori)*: > 0.7
 - *Resolution Rate*: Between 5% and 95%

Students are classified into **four levels of competence** (Level 1 to Level 4), anchored by solution rates and difficulty estimates. For example:

- *Level 1*: No milestone achievement, $< 50\%$ solution rate
- *Level 4*: High competence, anchored items with $> 65\%$ solution rate

This model supports **criterion-referenced interpretation**, adaptive testing, and curriculum refinement

∞ Bridging the Two Domains

Both frameworks—phenomenological counselling and IRT-based engineering assessment—share a commitment to:

- **Contextualized learning**: Whether through lifeworld narratives or circuit simulations.
- **Competency development**: Psychological insight vs. technical mastery.
- **Reflective practice**: Career identity formation vs. problem-solving calibration.

Together, they offer a **dual lens** for designing educational systems that are both **human-centered and performance-driven**.

I can help you design a VBA module that models career counselling readiness using SCCT and CCT dimensions, or simulate IRT-based scoring for electrical engineering tasks. Just say the word and I'll scaffold it for your credential-linked framework.

[SciELO](#)

[Phenomenological engagement as pedagogical impetus in career ...](#)

[ajcd.africa](#)

[Encouraging phenomenological consciousness in student educational ...](#)

This module simulates how a student or candidate might be evaluated across both humanistic and technical domains.

VBA Module: Career Counselling & Engineering Competence Evaluator

```
vb
' === Dual Readiness Evaluator: Career Counselling + Engineering Competence
===
Sub EvaluateDualReadiness()
    Dim cognitiveScore As Double
    Dim personalityScore As Double
    Dim integrityScore As Double
    Dim exposureScore As Double
    Dim motivationScore As Double
    Dim careerReadinessIndex As Double
    Dim engineeringSolutionRate As Double
    Dim wmnsq As Double
    Dim tValue As Double
    Dim engineeringLevel As String
    Dim careerFramework As String

    ' === Career Counselling Inputs (Phenomenological Dimensions) ===
    cognitiveScore = 85
    personalityScore = 78
    integrityScore = 88
    exposureScore = 72 ' SCCT: exposure, reinforcement
    motivationScore = 80 ' CCT: motivation, life roles

    ' === Career Readiness Index Calculation ===
    careerReadinessIndex = Round((cognitiveScore * 0.3 + personalityScore *
0.2 + integrityScore * 0.2 + exposureScore * 0.15 + motivationScore * 0.15),
2)
```



```

' === Career Framework Mapping ===
If careerReadinessIndex >= 85 Then
    careerFramework = "Narrative + Happenstance (Agency & Action)"
ElseIf careerReadinessIndex >= 70 Then
    careerFramework = "SCCT + CCT (Self-efficacy & Identity)"
Else
    careerFramework = "STF (Relational Mapping & Support)"
End If

' === Engineering Competence Inputs (IRT Parameters) ===
engineeringSolutionRate = 66 ' % of correct responses
wmnsq = 1.03
tValue = 0.3

' === Engineering Level Classification ===
If engineeringSolutionRate >= 65 And wmnsq >= 0.5 And wmnsq <= 1.5 And
Abs(tValue) < 2 Then
    engineeringLevel = "Level 4 - Anchored Competence"
ElseIf engineeringSolutionRate >= 50 Then
    engineeringLevel = "Level 3 - Nearly Anchored"
ElseIf engineeringSolutionRate >= 35 Then
    engineeringLevel = "Level 2 - Emerging Competence"
Else
    engineeringLevel = "Level 1 - Unanchored"
End If

' === Output Summary ===
MsgBox "Career Readiness Index: " & careerReadinessIndex & vbCrLf & _
    "Mapped Career Framework: " & careerFramework & vbCrLf & _
    "Engineering Solution Rate: " & engineeringSolutionRate & "%" &
vbCrLf & _
    "WMNSQ: " & wmnsq & " | T-Value: " & tValue & vbCrLf & _
    "Engineering Competence Level: " & engineeringLevel
End Sub

```

□ What This Module Does

- **Simulates career readiness** using phenomenological counselling theories
- **Maps readiness to frameworks** like SCCT, CCT, STF, and Happenstance
- **Evaluates engineering competence** using IRT parameters (WMNSQ, T-value, solution rate)
- **Classifies students into levels** based on TIMSS-style anchoring

I can now extend this module to include:

- **Panel-based moderation scores**
- **Narrative prompts for career reflection**
- **Export logic for ICASS/TVET or SAQA credential mapping**

Let me know if you'd like to simulate a full assessment dashboard or integrate this into your didactic panel system.

VBA Module: Phenomenological & Conceptual Change Readiness Evaluator

```
vb
' === Phenomenological & Conceptual Change Readiness Evaluator ===
Sub EvaluateStudentReadiness()
    Dim cognitiveConflictScore As Double
    Dim metaphoricalThinkingScore As Double
    Dim softwareEngagementScore As Double
    Dim phenomenologicalAwarenessScore As Double
    Dim conceptualChangeIndex As Double
    Dim readinessLevel As String
    Dim learningMode As String

    ' === Input Scores from Assessment or Observation ===
    cognitiveConflictScore = 78      ' e.g., from pre/post test delta
    metaphoricalThinkingScore = 82   ' e.g., from metaphor comprehension
tasks
    softwareEngagementScore = 90     ' e.g., from usage logs or
questionnaire
    phenomenologicalAwarenessScore = 85 ' e.g., from reflective prompts or
interviews

    ' === Composite Conceptual Change Index Calculation ===
    conceptualChangeIndex = Round((cognitiveConflictScore * 0.25 + _
                                   metaphoricalThinkingScore * 0.25 + _
                                   softwareEngagementScore * 0.25 + _
                                   phenomenologicalAwarenessScore * 0.25), 2)

    ' === Readiness Level Classification ===
    Select Case conceptualChangeIndex
        Case Is >= 85
            readinessLevel = "Level 4 - Deep Conceptual Shift"
            learningMode = "Embodied, Reflective, Exploratory"
        Case Is >= 70
            readinessLevel = "Level 3 - Transitional Understanding"
            learningMode = "Guided Analogy, Scaffolded Simulation"
        Case Is >= 55
            readinessLevel = "Level 2 - Emerging Awareness"
            learningMode = "Cognitive Conflict + Visual Models"
        Case Else
            readinessLevel = "Level 1 - Surface Engagement"
            learningMode = "Direct Instruction + Misconception Diagnosis"
    End Select

    ' === Output Summary ===
    MsgBox "Conceptual Change Index: " & conceptualChangeIndex & vbCrLf & _
        "Readiness Level: " & readinessLevel & vbCrLf & _
        "Recommended Learning Mode: " & learningMode
End Sub
```

What This Module Captures

- **Phenomenological engagement:** via reflection and awareness scores
- **Conceptual change:** through conflict, metaphor, and software interaction

- **Instructional design:** aligns with your thesis sections on analogies, cognitive conflict, and exploratory learning
- **Level modeling:** mirrors IRT-based classification (Level 1–4)

Would you like to extend this module to include **IRT parameters** (e.g., WMNSQ, T-value) or link it to **pre/post/delayed test data** from your software evaluation framework? I can also scaffold a bilingual export or dashboard-ready version.

Importance of the Topic: Learner & Teacher Perspectives

☐ For the Learner

Interactive software fosters:

- **Independent learning:** Students gain confidence through personalized pacing and motivational feedback.
- **Cognitive strategies:** They develop problem-solving and conceptual reasoning skills.
- **Imaginative and exploratory thinking:** Encouraged by visual models, analogies, and simulations.

This aligns with constructivist principles and conceptual change theory, where learners actively restructure their understanding through cognitive conflict and engagement.

For the Teacher

The software serves as a:

- **Remedial tool:** Tailored to various knowledge levels, helping diagnose misconceptions and alternative frameworks.
- **Differentiated support system:** Teachers can focus on students with specific difficulties, while others self-correct via feedback.
- **Efficiency enhancer:** Enables better distribution of instructional effort and fosters a more pleasant, collaborative learning atmosphere.

Literature Review Highlights

Your thesis integrates:

- **Misconceptions in electricity:** Around current, resistance, potential difference, and circuit analysis.
- **Analogical instruction:** Using models like flowing fluids or crowds to explain electrical phenomena.
- **IT-enhanced learning:** Through HyperCard, simulations, and multimedia tools.
- **Conceptual change strategies:** Including cognitive conflict, visual learning, and metaphorical thinking.

Methodological Foundations

- **Constructivist learning:** Emphasizes conceptual change, cognitive conflict, and learner agency.
- **Instructional design:** Focuses on feedback, learner control, and exploratory environments.
- **Software evaluation:** Through pre/post/delayed tests, questionnaires, and qualitative analysis.

Would you like me to generate a VBA module that models learner progression based on conceptual change indicators (e.g., confidence, cognitive conflict, metaphor use, and feedback engagement)? I can also scaffold a dashboard for teacher diagnostics and remediation mapping.

This module integrates:

- Diagnostic scoring from Questions 1 & 6
- Sequential reasoning and explanation quality
- Software influence on conceptual change

VBA Module: Conceptual Change Tracker for Electricity Education

vb

```
' === Conceptual Change Tracker: Pre, Post, Delayed Test Phases ===
Sub TrackConceptualChange()
    Dim preTestScoreQ1 As Double, preTestScoreQ6 As Double
    Dim postTestScoreQ1 As Double, postTestScoreQ6 As Double
    Dim delayedTestScoreQ1 As Double, delayedTestScoreQ6 As Double
    Dim explanationQualityPre As Double, explanationQualityPost As Double,
explanationQualityDelayed As Double
    Dim sequentialReasoningScore As Double
    Dim softwareInfluenceIndex As Double
    Dim conceptualChangeLevel As String

    ' === Input Scores ===
    preTestScoreQ1 = 40
    preTestScoreQ6 = 35
    postTestScoreQ1 = 75
    postTestScoreQ6 = 70
    delayedTestScoreQ1 = 82
    delayedTestScoreQ6 = 78

    explanationQualityPre = 45
    explanationQualityPost = 72
    explanationQualityDelayed = 85

    sequentialReasoningScore = 80
    softwareInfluenceIndex = Round((postTestScoreQ1 + postTestScoreQ6 +
explanationQualityPost + sequentialReasoningScore) / 4, 2)

    ' === Conceptual Change Classification ===
    If softwareInfluenceIndex >= 80 And explanationQualityDelayed >= 80 Then
```



```

        conceptualChangeLevel = "Level 4 - Deep Conceptual Shift"
    ElseIf softwareInfluenceIndex >= 65 Then
        conceptualChangeLevel = "Level 3 - Transitional Understanding"
    ElseIf softwareInfluenceIndex >= 50 Then
        conceptualChangeLevel = "Level 2 - Emerging Awareness"
    Else
        conceptualChangeLevel = "Level 1 - Surface Engagement"
    End If

    ' === Output Summary ===
    MsgBox "Pre-Test Scores: Q1=" & preTestScoreQ1 & ", Q6=" & preTestScoreQ6
& vbCrLf & _
        "Post-Test Scores: Q1=" & postTestScoreQ1 & ", Q6=" &
postTestScoreQ6 & vbCrLf & _
        "Delayed-Test Scores: Q1=" & delayedTestScoreQ1 & ", Q6=" &
delayedTestScoreQ6 & vbCrLf & _
        "Explanation Quality (Pre/Post/Delayed): " & explanationQualityPre
& "/" & explanationQualityPost & "/" & explanationQualityDelayed & vbCrLf & _
        "Sequential Reasoning Score: " & sequentialReasoningScore & vbCrLf
& _
        "Software Influence Index: " & softwareInfluenceIndex & vbCrLf & _
        "Conceptual Change Level: " & conceptualChangeLevel
End Sub

```

□ What This Module Captures

- **Misconception diagnosis and correction** across phases
- **Explanation quality and reasoning development**
- **Software’s pedagogical impact** on conceptual change
- **Level modeling** aligned with your thesis (Levels 1–4)

I can now extend this module to include:

- **Metaphor comprehension scores**
- **Analogical model usage tracking**
- **Export-ready dashboards for teacher feedback and curriculum design**

Would you like to integrate this with your ICASS/TVET reporting framework or simulate learner profiles across different misconception categories?

🔗 Categories of Student Conceptual Change (Questions 1 & 6)

1. Wrong Answer + Wrong Explanation → Correct Answer + Correct Explanation

- **Initial misconception:** Belief that bulb brightness depends on its position relative to resistors.
- **Post-test shift:** Recognition that **resistor order doesn’t affect current**; brightness depends on total resistance.
- **Example:** “The bulb is brighter because it is before the resistors” → “It does not matter which order they are in.”

2. Correct Answer + Wrong Explanation → Correct Answer + Correct Explanation

- **Initial reasoning flaw:** Guessing or misattributing brightness to fewer resistors without linking to current flow.
- **Post-test improvement:** Clear articulation of **Ohm’s Law** and current-resistance relationship.

3. Correct Answer + No Explanation → Correct Answer + Informed Explanation

- **Initial gap:** Correct guesses without conceptual grounding.
- **Post-test gain:** Use of terms like “flow of electrons,” “resistance,” and “brightness” in scientifically accurate ways.

4. Correct Answer + Correct Explanation → Refined Explanation

- **Initial strength:** Sound understanding using formal physics (e.g., $V = IR$).
- **Post-test evolution:** Shift toward **model-based language** (e.g., “resistor controls the flow of current”), showing influence of software metaphors and analogies.

5. No Answer → Correct Answer + Explanation

- **Initial disengagement or uncertainty.**
- **Post-test engagement:** Adoption of peer-like language and analogical reasoning (e.g., “resistors control the flow of current”).

☐ Pedagogical Implications

- **Software influence** is evident not only in **correcting misconceptions** but also in **reshaping the language** students use to express understanding.
- Even **high-performing students** adapted their explanations to reflect the **models and analogies** introduced by the software.
- The shift from **formulaic reasoning** (e.g., $V = IR$) to **conceptual metaphors** (e.g., “resistors control flow”) suggests deeper **embodied understanding**.

☐ Suggested VBA Extension

Would you like a VBA module that:

- Tracks **student category transitions** (e.g., from “no explanation” to “model-based explanation”)?
- Calculates a **conceptual change score** based on explanation quality and language shift?
- Flags students for **targeted feedback** or **remedial support**?

I can scaffold that next to support your didactic panel or ICASS-aligned reporting system.

Summary of Key Findings

✔ Questions (Q Tot)

- **ANOVA:** Significant improvement from Pre to Post and Pre to Delayed ($F = 105.705$, $p < .0001$).
- **Wilcoxon:** Confirmed significant gains ($Z = -4.784$, $p < .0001$).
- **Mean Scores:**
 - Pre: 42.1
 - Post: 57.27
 - Delayed: 56.5
- **Interpretation:** Students retained conceptual gains over time, with minimal drop-off between Post and Delayed.

✔ Explanations (Exp Tot)

- **ANOVA:** Strong improvement across phases ($F = 1110.702$, $p < .0001$).
- **Wilcoxon:** Significant change ($Z = -4.784$, $p < .0001$).
- **Mean Scores:**
 - Pre: 36.33
 - Post: 54.03
 - Delayed: 49.87
- **Interpretation:** Students improved in articulating reasoning, though some regression occurred by the delayed phase.

✔ Exercise Scores

- **ANOVA:** Significant improvement ($F = 115.233$, $p < .0001$).
- **Wilcoxon:** All comparisons significant (Pre vs Post: $Z = -4.703$, $p < .0001$).
- **Mean Scores:**
 - Pre: 1.23
 - Post: 2.97
 - Delayed: 2.6
- **Interpretation:** Practical application improved and remained high.

✔ Question 6 (Q6c)

- **ANOVA:** Significant improvement ($F = 14.087$, $p < .0001$).
- **Wilcoxon:** Confirmed ($Z = -3.357$, $p < .0008$).
- **Mean Scores:**
 - Pre: 2.167
 - Post/Delayed: 3.0
- **Interpretation:** Misconceptions about circuit structure were corrected and retained.

✔ Explanation 6 (E6c)

- **ANOVA:** Significant improvement ($F = 15.575$, $p < .0001$).
- **Wilcoxon:** Confirmed ($Z = -3.418$, $p < .0006$).

- **Mean Scores:**
 - Pre: 2.133
 - Post/Delayed: 3.0
- **Interpretation:** Students improved in explaining circuit behavior using correct scientific reasoning.

Reliability Estimates

Measure	All Treatments	Single Treatment
Questions	-0.333	-0.091
Explanations	0.469	0.228
Exercise	0.635	0.367
Q6c	-0.593	-0.142
E6c	-0.659	-0.153

Interpretation:

- Negative reliability for Q6c and E6c suggests high variability or ceiling effects (many students scored full marks post-intervention).
- Exercises and general explanations show moderate to strong reliability, supporting consistent learning gains.

Educational Implications

- **Software intervention** significantly improved conceptual understanding and explanation quality.
- Gains were **statistically significant and educationally meaningful**, especially in correcting misconceptions about resistance, current flow, and circuit structure.
- **Retention** of knowledge was strong across delayed testing, validating the use of analogical models and cognitive conflict strategies.

I can now generate a VBA module that calculates conceptual change scores and flags statistically significant improvements across phases. Would you like it to include reliability thresholds and diagnostic alerts for low-consistency items?

Core Achievements of the Research

1. **Design of HyperCard-based multimedia teaching packages**
 - Targeted at first-year university students studying electricity.
 - Grounded in students' misconceptions and alternative frameworks.
2. **Evaluation of software as a learning tool**
 - Demonstrated effectiveness in improving understanding of current (I), potential difference (V), resistance (R), and their interrelationships.
3. **Activation of conceptual change**

- Students confronted their own models, leading to reflection, modification, and deeper understanding.

Key Research Questions Addressed

- Did the software improve conceptual understanding?
- Did modelling provide a powerful learning environment?
- Did the software help diagnose and correct misconceptions?
- How effective was the software in facilitating learning?

✓ **Answer:** Yes, across all dimensions—conceptual, motivational, and cognitive.

Recommendations

1. More Time on Software in Full Courses

- 67% of students requested extended use.
- Shorter, modular sessions suggested for better retention.
- Supported by research (Atkinson, Parker & Lepper, Bork) showing time-on-task correlates with learning outcomes.

2. Software for All Student Levels

- Low and Middle-level students benefited most.
- High-level students found it less challenging.
- Recommendation: Co-design with interdisciplinary teams to meet diverse cognitive needs.

3. Influence on Cognitive Behavior

- 27% (Q1) and 37% (Q6) of students changed their explanatory language post-intervention.
- Most influenced: Low and Middle-level students.
- Suggests strong impact on **metacognition and reasoning style**.

Framework of Research

- Focused on **remedial activities integrated into classroom practice**.
- Based on **persistent misconceptions** in electricity (e.g., Ohm's Law, series/parallel resistors).
- Software provided **motivational feedback**, enhancing learner-computer interaction.

Limitations

- **Data collection constraints** (e.g., lack of permission for audio recordings).

- **Sample size** and **generalizability** require further study.
- **Differentiation for high-level learners** remains a design challenge.

Suggested Follow-Up

I can generate a VBA module that tracks time-on-software engagement, maps it to conceptual gains, and flags students who may benefit from extended sessions or differentiated content. Would you like it to include a readiness index based on misconception correction and explanation quality?

☐ Conceptual Gains from Questions 1 & 6

Key Findings:

1. **Sequential reasoning was diagnosed and improved.**
2. **Number of correct answers and explanations increased** from Pre to Post and Delayed-post tests.
3. **Mean scores improved significantly**, especially among Low and Middle-level students.
4. **Students changed their explanatory language**, reflecting deeper understanding and influence from the software's models and analogies.

Performance Summary:

Phase	Correct Answers	Correct Explanations	Changed Wording
Pre-Test	Low	Low	Minimal
Post-Test	High	Moderate–High	Evident
Delayed-Post	Sustained High	High	Strong Influence

Questionnaire Insights

Question 1: Logical Sequence of Data

- **22/30 strongly agreed** the software provided step-by-step logic.
- Students appreciated **theory + questions**, and **HyperCard-style presentation**.

Question 2: Encouraging Exploration

- **26/30 agreed or strongly agreed.**
- Positive feedback on **theory + hints**, with minor critique on engagement consistency.

Question 3: Planning Solutions Systematically

- **19/30 agreed or strongly agreed.**
- Students valued **text fields + theory**, though some noted confusion or guessing.

Question 10a–10c: Concept Presentation, Knowledge Increase, Interest

- **21/30 strongly agreed** the software was useful.
- Explanations praised **animated illustrations**, **multiple reasoning paths**, and **interactive design**.

Question 11: Desire for More Time

- **18/30 strongly agreed**, with 12 more agreeing.
- Students requested **longer sessions**, **modular pacing**, and **more theory integration**.

Pedagogical Implications

- **Low and Middle-level students benefited most**, confirming the software's scaffolding strength.
- **High-level students** requested more depth, suggesting a need for adaptive content layers.
- **HyperCard-based design** was effective in stimulating interest, planning, and conceptual change.
- **Metacognitive shifts** were evident in students' language and reasoning patterns.

Suggested Follow-Up

I can generate a VBA module that tracks individual student progression across Questions 1 & 6, maps explanation quality, and flags conceptual change based on wording shifts and test phase comparisons. This can support your didactic panel evaluations and ICASS/TVET reporting. Would you like me to scaffold that next?

:

Quantitative Gains in Conceptual Understanding

✔ Question 1

- **Correct answers** increased from 78% to 100% (29% gain).
- **Correct explanations** rose from 63% to 100% (58% gain).
- **Mean score increase:**
 - Question 1: +20%
 - Explanation 1: +35.75%

✔ Question 6

- **Correct answers** increased from 64% to 100% (56% gain).
- **Correct explanations** rose from 57% to 100% (74% gain).
- **Mean score increase:**
 - Question 6: +33.5%

- Explanation 6: +41%

Q Interpretation: The software not only improved accuracy but also deepened students’ ability to explain their reasoning—especially in areas prone to misconceptions like bulb location and resistance.

□ Diagnostic Insights

- **Sequential reasoning errors** were common in the pre-test, especially in Questions 1.b and 1.d.
- **Post-test and delayed-post test** responses showed:
 - Correct use of scientific terminology.
 - Adoption of software-provided language and analogies.
 - Homogenization of performance across Low, Middle, and High-level students.

□ Software Design Strategies That Worked

1. **Fixing the right category** without over-specifying meaning (Jung, 1985).
2. **Energy perspective:** Teaching circuits as systems where energy flows (Hartel, Steinberg).
3. **Distinguishing energy flow vs. electron flow** (Rhoneck & Volker, 1985).
4. **Mental model scaffolding:**
 - Target system → conceptual model → learner’s mental model → scientific conceptualization.

These strategies helped students shift from intuitive or visual misconceptions to structured, scientific reasoning.

Student-Level Impact

Question	Low-Level Beneficiaries	Middle-Level Beneficiaries	High-Level Beneficiaries
1.b	10	3	—
1.d	10	2	—
Explanation 1.b	10	5	—
Explanation 1.d	10	3	1

Q Insight: Low-level students showed the greatest improvement, but Middle-level students also benefited significantly—especially in explanation quality.

□ Suggested Follow-Up

I can now generate a VBA module that tracks individual student gains across Questions 1 & 6, calculates percentage improvements, and flags conceptual shifts based on explanation quality and terminology changes. This module can support diagnostic reporting, remediation planning, and curriculum refinement. Would you like me to scaffold that next?

VBA Module: Conceptual Gains Tracker for Questions 1 & 6

vb

```
Sub TrackConceptualGains()
    Dim preCorrectQ1 As Integer, postCorrectQ1 As Integer
    Dim preExplainQ1 As Integer, postExplainQ1 As Integer
    Dim preCorrectQ6 As Integer, postCorrectQ6 As Integer
    Dim preExplainQ6 As Integer, postExplainQ6 As Integer
    Dim percentGainQ1 As Double, percentGainExplainQ1 As Double
    Dim percentGainQ6 As Double, percentGainExplainQ6 As Double
    Dim conceptualShiftFlag As String

    ' === Input Data ===
    preCorrectQ1 = 23
    postCorrectQ1 = 30
    preExplainQ1 = 19
    postExplainQ1 = 30
    preCorrectQ6 = 19
    postCorrectQ6 = 30
    preExplainQ6 = 17
    postExplainQ6 = 30

    ' === Calculate Percentage Gains ===
    percentGainQ1 = Round(((postCorrectQ1 - preCorrectQ1) / preCorrectQ1) * 100, 2)
    percentGainExplainQ1 = Round(((postExplainQ1 - preExplainQ1) / preExplainQ1) * 100, 2)
    percentGainQ6 = Round(((postCorrectQ6 - preCorrectQ6) / preCorrectQ6) * 100, 2)
    percentGainExplainQ6 = Round(((postExplainQ6 - preExplainQ6) / preExplainQ6) * 100, 2)

    ' === Flag Conceptual Shift ===
    If percentGainExplainQ1 >= 35 And percentGainExplainQ6 >= 40 Then
        conceptualShiftFlag = "Strong conceptual shift detected"
    ElseIf percentGainExplainQ1 >= 20 Or percentGainExplainQ6 >= 25 Then
        conceptualShiftFlag = "Moderate conceptual shift"
    Else
        conceptualShiftFlag = "Minimal shift - further support needed"
    End If

    ' === Output Summary ===
    MsgBox "📊 Conceptual Gains Summary:" & vbCrLf & _
        "Question 1 - Correct Answer Gain: " & percentGainQ1 & "%" & vbCrLf & _
        "Question 1 - Explanation Gain: " & percentGainExplainQ1 & "%" & vbCrLf & _
        "Question 6 - Correct Answer Gain: " & percentGainQ6 & "%" & vbCrLf & _
        conceptualShiftFlag
```



```

        "Question 6 - Explanation Gain: " & percentGainExplainQ6 & "%" &
vbCrLf & _
        "□ Diagnostic Insight: " & conceptualShiftFlag
End Sub

```

□ What This Module Captures

- Tracks gains in accuracy and explanation quality.
- Flags conceptual shifts based on thresholds.
- Supports remediation by identifying students needing further support.

I can now extend this module to include **student-level breakdowns, background knowledge tiers, or language shift detection** from pre- to post-test. Just say the word and I'll scaffold it for your didactic panel.

.

🔧 VBA Module: Conceptual Change Tracker for Questions 1 & 6

```

vb
Sub ConceptualChangeTracker()
    Dim studentName As String
    Dim preAnswerQ1 As Boolean, postAnswerQ1 As Boolean, delayedAnswerQ1 As Boolean
    Dim preExplainQ1 As Integer, postExplainQ1 As Integer, delayedExplainQ1 As Integer
    Dim preAnswerQ6 As Boolean, postAnswerQ6 As Boolean, delayedAnswerQ6 As Boolean
    Dim preExplainQ6 As Integer, postExplainQ6 As Integer, delayedExplainQ6 As Integer
    Dim wordingShiftQ1 As Boolean, wordingShiftQ6 As Boolean
    Dim conceptualChangeScore As Double
    Dim changeLevel As String

    ' === Sample Student Data ===
    studentName = "Student A"
    preAnswerQ1 = False
    postAnswerQ1 = True
    delayedAnswerQ1 = True
    preExplainQ1 = 1 ' scale: 0 = none, 1 = partial, 2 = complete
    postExplainQ1 = 2
    delayedExplainQ1 = 2
    wordingShiftQ1 = True

    preAnswerQ6 = False
    postAnswerQ6 = True
    delayedAnswerQ6 = True
    preExplainQ6 = 1
    postExplainQ6 = 2
    delayedExplainQ6 = 2
    wordingShiftQ6 = True

    ' === Conceptual Change Score Calculation ===

```



```

        conceptualChangeScore = 0
        If postAnswerQ1 And delayedAnswerQ1 Then conceptualChangeScore =
conceptualChangeScore + 1
        If postAnswerQ6 And delayedAnswerQ6 Then conceptualChangeScore =
conceptualChangeScore + 1
        If postExplainQ1 = 2 And delayedExplainQ1 = 2 Then conceptualChangeScore
= conceptualChangeScore + 1
        If postExplainQ6 = 2 And delayedExplainQ6 = 2 Then conceptualChangeScore
= conceptualChangeScore + 1
        If wordingShiftQ1 Then conceptualChangeScore = conceptualChangeScore +
0.5
        If wordingShiftQ6 Then conceptualChangeScore = conceptualChangeScore +
0.5

' === Classification of Conceptual Change Level ===
Select Case conceptualChangeScore
    Case Is >= 5
        changeLevel = "High conceptual change"
    Case Is >= 3
        changeLevel = "Moderate conceptual change"
    Case Else
        changeLevel = "Low conceptual change"
End Select

' === Output Summary ===
MsgBox "📋 Conceptual Change Report for " & studentName & vbCrLf & _
    "Q1 Answer Progression: " & preAnswerQ1 & " → " & postAnswerQ1 & "
→ " & delayedAnswerQ1 & vbCrLf & _
    "Q1 Explanation Quality: " & preExplainQ1 & " → " & postExplainQ1
& " → " & delayedExplainQ1 & vbCrLf & _
    "Q6 Answer Progression: " & preAnswerQ6 & " → " & postAnswerQ6 & "
→ " & delayedAnswerQ6 & vbCrLf & _
    "Q6 Explanation Quality: " & preExplainQ6 & " → " & postExplainQ6
& " → " & delayedExplainQ6 & vbCrLf & _
    "Wording Shift Detected: Q1=" & wordingShiftQ1 & ", Q6=" &
wordingShiftQ6 & vbCrLf & _
    "📊 Conceptual Change Level: " & changeLevel
End Sub

```

📋 What This Module Captures

- Tracks progression of correct answers and explanation quality across phases.
- Flags wording shifts as indicators of metacognitive change.
- Calculates a conceptual change score and classifies impact level.
- Can be extended to loop through multiple students or export diagnostic summaries.

I can now scaffold this into a full diagnostic dashboard or integrate it with your ICASS moderation tables. Just let me know how you'd like to expand it.

.

🔧 VBA Module: Conceptual Readiness & Engagement Tracker

vb

```
Sub TrackConceptualReadiness()  
    Dim studentName As String  
    Dim timeOnSoftware As Double ' in minutes  
    Dim preMisconceptions As Integer  
    Dim postMisconceptions As Integer  
    Dim explanationQuality As Integer ' scale: 0 = none, 1 = partial, 2 =  
complete  
    Dim readinessIndex As Double  
    Dim engagementLevel As String  
    Dim recommendation As String  
  
    ' === Sample Student Data ===  
    studentName = "Student A"  
    timeOnSoftware = 42 ' minutes  
    preMisconceptions = 4  
    postMisconceptions = 1  
    explanationQuality = 2  
  
    ' === Readiness Index Calculation ===  
    Dim misconceptionCorrection As Double  
    misconceptionCorrection = preMisconceptions - postMisconceptions  
    If misconceptionCorrection < 0 Then misconceptionCorrection = 0  
  
    readinessIndex = Round((timeOnSoftware * 0.3 + misconceptionCorrection *  
20 + explanationQuality * 25) / 100, 2)  
  
    ' === Engagement Classification ===  
    If timeOnSoftware >= 60 Then  
        engagementLevel = "High"  
    ElseIf timeOnSoftware >= 30 Then  
        engagementLevel = "Moderate"  
    Else  
        engagementLevel = "Low"  
    End If  
  
    ' === Recommendation Logic ===  
    If readinessIndex >= 0.8 Then  
        recommendation = "Ready for advanced content"  
    ElseIf readinessIndex >= 0.5 Then  
        recommendation = "Continue with current module; reinforce  
explanations"  
    Else  
        recommendation = "Schedule extended sessions and provide remedial  
support"  
    End If  
  
    ' === Output Summary ===  
    MsgBox "■ Conceptual Readiness Report for " & studentName & vbCrLf & _  
        "Time on Software: " & timeOnSoftware & " minutes (" &  
engagementLevel & " engagement)" & vbCrLf & _  
        "Misconceptions Corrected: " & misconceptionCorrection & vbCrLf &  
_  
        "Explanation Quality: " & explanationQuality & " (0=None,  
1=Partial, 2=Complete)" & vbCrLf & _  
        "■ Readiness Index: " & readinessIndex & vbCrLf & _
```


End Sub "🔧 Recommendation: " & recommendation

□ What This Module Captures

- **Time-on-task** as a predictor of learning outcomes.
- **Misconception correction** as a core metric of conceptual change.
- **Explanation quality** as a proxy for metacognitive development.
- **Readiness index** to guide differentiated instruction and support.

I can now extend this to loop through multiple students, export results to a dashboard, or integrate it with your ICASS/TVET moderation tables. Just say the word and I'll scaffold the next layer.