Today

**Copilot said**

**Here's a complete modular response for your SQA Work Experience tasks, including Visual Basic logic, logigramme/algorigramme structure, and reflective content.**

**🔧 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 | |
| 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/government/statistics/health-and-safety-statistics-2020-to-2021-annual-release" \t "_blank)

[Health and Safety statistics: 2020 to 2021 annual release](https://www.gov.uk/government/statistics/health-and-safety-statistics-2020-to-2021-annual-release" \t "_blank)

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**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
2. .
3. **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
4. **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 |
| 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

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 |
| **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

**🔄 Logigramme 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) |
| **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 |
| 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 & Magnetics"

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

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 Z0Z\_0, propagation constant γ\gamma, attenuation α\alpha, phase constant β\beta, velocity ν\nu

**🔹 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: λ² - (a+d)λ + (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

Eigenvalue2x2 = "λ₁ = " & Format(lambda1, "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 |
| 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 (Ixx)
* 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) | Ixx 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 ID and VGS |
| (e) | Resistor Design | Solve for R1 and R2 given parallel resistance constraint |
| (f) | ADC Resolution | Determine min/max values of pos 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:

' Vth = Vsat \* (R2 / (R1 + R2)) => R2/R1 = Vth / (Vsat - Vth)

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

' Rparallel = (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 |
| 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, Ixx, 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 | ΣM = 0 in x-y and x-z planes | R\_B = 180 kN @ 1.2° |
| 8(c) | Roller stiffness | δ = (ωL⁴)/(384EI) | Larger I → less deflection |
| 8(d) | RC integrator | V\_out = -∫V\_in dt / RC | R = 25 Ω |
| 8(e) | DAC resistors | V\_out = -Σ(V\_i × R\_f/R\_i) | R\_A = 1.2 MΩ, R\_B = 600 kΩ… |
| 9(a) | Bending moment | M = R\_Ax - ωx²/2 | M(1.2) = 280 kNm, M(3) = 350 kNm |
| 9(b) | Beam stress | σ = My/I | Beam 2 selected |
| 9(c) | Sustainability | Design for energy, recyclability | Material/process selection |
| 9(d–g) | PWM & ADC | delayMicroseconds(limit) | Space > 16383 → 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"

End Sub

**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 |
| 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 |
| 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 |
| **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 (mm⁴)** |
| --- | --- |
| 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: 101×103 mm4101 \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 = (σ × I) / y × (1 / 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 × L²) / 8 → L = 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



















