



★ OFFICIAL MASTER CURRICULUM EDITION · NEW ACADEMIC YEAR 2026 / 2027

The Comprehensive Master Compendium in Computer Science & AI

Learn to Code.. Build Your Future!

Complete Ministry Textbook with In-Depth Engineering & Real-World Case Studies
Grade 10 (Secondary 1): First Term — Official Master Edition (2025 / 2026 — 2026 / 2027)

```
sayed_afandy_academy.py — Python 3.14

class SayedAfandyAcademy:
    # Official Secondary Platform · sayedafandy.com
    def __init__(self):
        self.instructor = "Eng. Sayed Sami (Sayed Afandy)"
        self.curriculum = "Computer Science & AI (Grade 10)"
        self.units = 13 # Complete First Term Units
        self.total_questions = 210 # Lesson Quizzes & Exams
    def build_future(self):
        return "Build Your Future! 🚀"
```



Official Master Compendium for Secondary Students

★ Approved Ministry Curriculum Syllabus (All 13 Units Complete)

74 Pages A4 · Full Answer Keys

U1 Knowledge Society & ICT Foundations	pp. 5-8	U2 Digital Rights, IP Laws & Privacy	pp. 9-12
U3 Information Security & Social Engineering	pp. 13-16	U4 Ergonomics, Health & E-Waste Recycling	pp. 17-20
U5 Telecommunications & Transmission Media	pp. 21-24	U6 Signal Processing & Lossless RLE Compression	pp. 25-30
U7 Computer Architecture & Logic Circuits	pp. 31-34	U8 Computer Networks & The TCP/IP Model	pp. 35-38
U9 Relational Databases, SQL & ERP Systems	pp. 39-42	U10 Data Analysis, Statistics & Regression	pp. 43-48
U11 Modeling, Simulation & Queuing Theory	pp. 49-52	U12 Algorithms & Python Programming	pp. 53-58
U13 Generative AI, Web Stack & Ethics	pp. 59-62	EX Appendices: 20 Traps + 5 Model Exams	pp. 63-74



13 Units

Ministry Textbook

In-depth theory & real scenarios



100%

All Activities Solved

Mathematical & coding tasks



210 Qs

Assessment Bank

45 lesson quizzes + 5 model exams



From Zero

Build Your Future

Professional tech foundation

SYLLABUS BLUEPRINT · PART 1

Ministry Learning Outcomes & Core Concepts Blueprint — Units 1 to 7

GRADE 10 COMPUTER SCIENCE & AI · MINISTRY OF EDUCATION OFFICIAL FRAMEWORK

 **Ministry Curriculum Vision:** Equipping secondary school students with deep conceptual and practical foundations in digital citizenship, knowledge society ethics, information security, computer architecture, network infrastructure, and algorithmic problem-solving.

◆ Core Conceptual Matrix & Assessment Targets (Units 1 - 7)

CURRICULUM MATRIX

Unit & Scope	Core Ministry Concepts & Topics	Measurable Learning Outcomes & Exam Competencies
Unit 1 · Knowledge Society Ministry Textbook pp. 7 – 15	- Data, Information & Knowledge hierarchy. - Three media categories (Expression, Transmission, Storage). - Media literacy, fact-checking & cross-verification. - Smartphone hazards while walking. - Countering cyberbullying & legal penalties.	Strictly differentiating between Data, Information, and Knowledge; categorizing media formats; identifying information properties (continuity, reproducibility, velocity); mastering digital etiquette, hazard avoidance, and reporting cybercrimes.
Unit 2 · Laws & Digital Rights Ministry Textbook pp. 16 – 34	- Personal vs Sensitive Data & Protection Law. - Right to privacy, image rights & publicity. - Intellectual Property (IP) & Software source code. - Industrial Property with 4 statutory protection periods. - Prior consent (Opt-in) vs Objection (Opt-out).	Understanding Egyptian constitutional privacy provisions; memorizing exact statutory protection durations (Patents 20 yrs, Utility Models 7 yrs, Industrial Designs 10+5 yrs, Trademarks 10 yrs renewable); securing source code and neighboring rights.
Unit 3 · Information Security Ministry Textbook pp. 35 – 48	- The CIA Triad (Confidentiality, Integrity, Availability). - Three security policy levels (Core, Standards, Procedures). - Password complexity permutations (36^n) & cracking time. 4 Social Engineering attacks (Shoulder, Dumpster, Skimming, Pretexting).	Applying access control matrices; mathematically calculating brute-force attack times using permutations; distinguishing between administrative policies, operational standards, and tactical procedures; mitigating social engineering and phishing attacks.
Unit 4 · Society & Health Ministry Textbook pp. 49 – 62	- Technostress, nomophobia & screen addiction. - Workspace ergonomics & the 20-20-20 rule. - Carpal Tunnel Syndrome (CTS) & musculoskeletal strain. - Electronic Waste (E-waste), urban mining & green datacenters.	Diagnosing physiological and psychological impacts of overuse; configuring ergonomic desk, chair, and monitor alignment; explaining toxic heavy metals in e-waste (Lead, Mercury), recovering precious metals (Gold, Silver), and auditing green datacenter metrics (PUE).
Unit 5 · Telecommunications Ministry Textbook pp. 63 – 78	- Shannon-Weaver communication model (Sender, Receiver, Channel). - Guided vs Unguided transmission media. - Fiber optics vs Copper cables & Total Internal Reflection. - Modulation principles (AM vs FM), 5G networks & LPWAN.	Tracing signal conversions between analog and digital; contrasting UTP/STP copper bandwidth with single-mode/multi-mode fiber immunity to EMI; calculating light critical angles; comparing carrier frequency modulation and IoT wireless topologies (LoRaWAN).
Unit 6 · Signals & Compression Ministry Textbook pp. 79 – 98	- Number systems (Binary, Decimal, Hexadecimal) conversions. - Analog-to-Digital Conversion (Sampling, Quantization, Encoding). - Lossless Run-Length Encoding (RLE) algorithm & savings. 4 Data design methodologies (Abstraction, Visualization, CUI vs GUI).	Performing manual conversions between base 2, base 10, and base 16; applying Nyquist theorem to avoid aliasing; executing RLE step-by-step and calculating storage compression percentage: $((\text{Original} - \text{Compressed}) / \text{Original}) * 100\%$; contrasting CUI and GUI ergonomics.
Unit 7 · Computer Architecture Ministry Textbook pp. 99 – 114	- Von Neumann model & Fetch-Decode-Execute cycle. - CPU sub-units & registers (PC, IR, MAR, MDR, ACC). - Fundamental logic gates (AND, OR, NOT, XOR). - Truth tables, Half Adder & Full Adder digital circuits.	Mapping instruction flow through the system buses (Data, Address, Control); analyzing clock speed (GHz) and cache levels; drawing logic gate schematics; deriving Boolean algebra expressions and truth tables; synthesizing digital arithmetic adders.

Ministry Learning Outcomes & Core Concepts Blueprint — Units 8 to 13

SYLLABUS BLUEPRINT · PART 2

GRADE 10 COMPUTER SCIENCE & AI · MINISTRY OF EDUCATION OFFICIAL FRAMEWORK

Core Conceptual Matrix & Assessment Targets (Units 8 - 13)

CURRICULUM MATRIX

Unit & Scope	Core Ministry Concepts & Topics	Measurable Learning Outcomes & Exam Competencies
Unit 8 · Networks & Internet Ministry Textbook pp. 115 – 128	4-Layer TCP/IP architectural stack & IP addressing. - Network hardware (Hub vs Switch vs Router). - Mail protocols: SMTP (sending), POP3 & IMAP (receiving). - Standard 9-part URL anatomical disassembly.	Distinguishing OSI/TCP-IP layer duties; contrasting Collision Domains (Hub vs Switch); analyzing dynamic IP routing; evaluating POP3 offline local storage vs IMAP multi-device cloud synchronization; disassembling web URLs into protocol, host, port, path, query, and anchor.
Unit 9 · Databases & ERP Ministry Textbook pp. 129 – 142	- Relational DBMS, Primary Keys & Foreign Keys. - Structured Query Language (SQL) & CRUD operations. - Vertical vs Horizontal enterprise system integration. - Enterprise Resource Planning (ERP) & Data Independence.	Designing normalized relational schemas; executing core SQL statements (SELECT, INSERT, UPDATE, DELETE); evaluating middleware and API pipelines; analyzing how ERP modules eliminate corporate data silos; explaining logical vs physical data independence.
Unit 10 · Statistics & Regression Ministry Textbook pp. 143 – 162	- Data types (Structured, Semi-Structured, Unstructured). 4 Data collection methods, Central Tendency & Dispersion. - Scatter plots, correlation types & trendlines. - Linear regression model ($y = mx + c$) & predictive calculations.	Classifying raw formats; choosing appropriate collection mechanisms (surveys, interviews, sensors); computing Mean, Median, Mode, Range, and Standard Deviation; substituting into regression equations to calculate future trends in energy, logistics, and business.
Unit 11 · Simulation & Queuing Ministry Textbook pp. 163 – 176	- Principles of mathematical modeling & simulation benefits. - Deterministic vs Stochastic computational models. - Monte Carlo probabilistic simulation & pseudo-random numbers. - Queuing theory (λ, μ, ρ) applied to banking & logistics.	Contrasting fixed deterministic equations with stochastic probability distributions; generating random numbers to forecast complex risk without physical destruction; calculating arrival rates, service rates, and server utilization factor $\rho = \lambda / \mu$.
Unit 12 · Algorithms & Python Ministry Textbook pp. 177 – 200	- Computational thinking pillars & Flowchart symbols. - Python syntax, dynamic typing, and if-elif-else logic. - Iteration structures: for loops, while loops, and range(). - Lists, index slicing, append(), min-value algorithm & geometry functions.	Deconstructing real-world problems into logical flowcharts; tracing Python code variable states across loop cycles; handling zero-indexed arrays; coding mathematical functions for geometric areas and executing minimum/maximum search algorithms.
Unit 13 · GenAI & Web Stack Ministry Textbook pp. 201 – 218	- Generative AI, Large Language Models & Transformers. 4-Pillar Prompt Engineering (Role, Task, Context, Constraints). - Modern web anatomy: HTML5 semantics, CSS3 & JavaScript. - Software Development Life Cycle (SDLC) & AI ethics/hallucinations.	Formulating structured prompts using the RTC-C framework; structuring clean responsive web markup and DOM event listeners; sequencing the 6 phases of SDLC (Planning to Maintenance); establishing AI governance against bias and hallucinations.

Official Ministry Examination Specification Blueprint (40 Marks)

EXAM BLUEPRINT

Section 1: Objective Items (MCQ) 10 Multiple-Choice Questions = 20 Marks	Section 2: Engineering & Coding 1 Calculation / Python Trace Task = 10 Marks	Section 3: Analytical Essay Items 2 Structured Short-Answer Tasks = 10 Marks	Total Examination Score Time Allowed: 90 Minutes = 40 Marks
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STUDY GUIDE & EXAM STRATEGY

Engineer's Guide to Distinction — Smart Study Roadmap to Score 40 / 40

HIGH-DISTINCTION STUDY STRATEGIES & MINISTRY EXAM MASTERY GUIDELINES

💡 **Eng. Sayed Sami's Golden Advice:** Computer Science and Artificial Intelligence is not a subject of rote memorization, but one of analytical engineering and computational thinking. Always understand "why" a technology exists before learning "how" it operates, link theory with hands-on practice, and you will achieve full marks with absolute confidence!

The 4 Pillars of Computer Science & AI Academic Mastery4 PILLARS OF MASTERY

01

Deep Conceptual Rigor

- Master exact nuances between technical terms.
- Understand underlying system trade-offs.
- Relate abstract concepts to real-world infrastructure.
- Avoid surface-level memorization without logic.

02

Mathematical Calculations

- Password cracking probabilities (36^n).
- Lossless RLE compression savings percentage.
- Linear regression trend predictions ($y = mx + c$).
- Base-2, base-10, and base-16 number conversions.

03

Code Execution & Tracing

- Trace Python loops line-by-line using trace tables.
- Account for zero-indexed list indices and ranges.
- Master conditional logic boundaries and off-by-one errors.
- Write modular, clean functions with return values.

04

Exam Traps & Simulation

- Review the 20 official Ministry exam traps carefully.
- Memorize the 40-term rapid capsule definitions.
- Solve the 45 topical lesson quizzes consistently.
- Simulate the 5 comprehensive model exams in 90 mins.

Recommended Time Management & Structured Revision RoadmapREVISION TIMETABLE

Study Phase	Target Curriculum Scope	Mastery Goals & Competencies
Phase 1: Foundations Units 1 to 4	Knowledge Society + Laws & IP + Information Security & Social Engineering + Digital Health.	Memorize industrial property statutory terms, compute password permutation security, and classify 4 social engineering vectors.
Phase 2: Systems & Hardware Units 5 to 9	Telecommunications + Number Systems & RLE + Von Neumann CPU & Logic Gates + Networks + Databases.	Master manual RLE steps, draw logic circuits and truth tables, disassemble full URLs, and write normalized SQL queries.
Phase 3: Analytics & Code Units 10 to 13	Data Types & Linear Regression + Simulation & Queuing + Python Computational Thinking + GenAI Web Stack.	Solve energy/sales regression problems, trace Python list algorithms, format prompt engineering frameworks, and map SDLC stages.
Phase 4: Exam Simulations Appendices & Model Exams	Top 20 Exam Pitfalls + 40-Term Capsule Glossary + 5 Comprehensive Ministry Model Exams (A, B, C, D, E).	Simulate real exam room constraints under 90 minutes, identify subtle question traps, and verify answers against official rubrics.

📌 **Important Notice for Students & Parents:** This compendium comprehensively covers every single sentence, diagram, table, and exercise in the official Egyptian Ministry of Education Textbook for 2025/2026 and 2026/2027. There is absolutely no need to consult third-party unverified sources!

LESSON 1-1 · PART 1

Information & Media — Knowledge Hierarchy & Characteristics of Digital Info

OFFICIAL MINISTRY TEXTBOOK PP. 7-8 · FUNDAMENTAL CONCEPTS

 **Ministry Learning Outcomes (Textbook pp. 7-8):** (1) Accurately distinguish between data, information, and knowledge. (2) Comprehend the core characteristics of information (persistence, reproducibility, propagation). (3) Differentiate between primary and secondary information and execute cross-checking.

01

Data

- Raw, unprocessed facts and symbols without context.
- Represented as numbers, characters, or symbols.
- Conveys no meaningful message on its own to the recipient.
- Example: "39.5" or "C".

02

Information

- Processed, organized, and contextualized data.
- Possesses clear meaning, value, and utility.
- Serves as a logical basis for decision-making.
- Example: "Patient's temperature is 39.5°C".

03

Knowledge

- Information analyzed, integrated, and accumulated through experience.
- Enables deduction of patterns and problem solving.
- Guides correct actions and treatments.
- Example: Diagnosing an infection requiring antibiotics.

04

Nature of Info

- Has no physical form or tangible substance.
- Value varies according to the recipient and delivery timing.
- Influenced by transmission channels and credibility.
- Forms the core foundation for Artificial Intelligence.

Three Core Characteristics of Information (Textbook p. 8)

CORE CHARACTERISTICS

Characteristic	Approved Scientific Definition	Textbook Examples & Real-World Applications
1 · Persistence Persistence	Once information is created, recorded, or published, it is difficult to erase completely and remains retrievable indefinitely.	Social media posts, rumors, and photos remain on internet servers and web archives even if deleted by the original poster.
2 · Reproducibility Reproducibility	The ability to reproduce identical copies easily and in vast quantities without any loss in original quality or accuracy, at near-zero cost.	Duplicating digital files, e-books, and audio recordings (hence copyright laws are enforced to protect creative content).
3 · Propagation Propagation	The capacity of information to flow and transmit instantly across long distances to an unlimited audience within seconds.	Global email transmission, satellite television broadcasts, breaking news tweets, and viral internet alerts.

Information Classification: Primary vs. Secondary Information

PRIMARY VS SECONDARY



Primary Information

Information obtained **directly through firsthand experience**, laboratory experiments, personal observation, or field surveys conducted by yourself (e.g., lab sensor measurements, raw interview transcripts, direct field notes).



Secondary Information

Information **not gathered directly, but received via a third party** or intermediary channel (e.g., newspaper reports, TV broadcasts, historical reference books). Subject to bias, distortion, or error, requiring cross-checking.

 **Cross-checking:** Comparing secondary information across multiple independent, credible sources to verify accuracy and reliability before acceptance.

Lesson Quick Quiz

LESSON QUICK QUIZ

1. Information acquired through a third party that requires cross-checking is:

[]

(A) Primary

(B) Secondary

(C) Raw Data

(D) Algorithmic

2. The characteristic meaning identical copies can be made without quality loss is:

[]

(A) Reproducibility

(B) Persistence

(C) Tangibility

(D) Exhaustibility

☐ 3. Digital information once published is difficult to completely delete (Persistence). ()

☐ 4. Raw data is the result of analyzing contextualized information. ()