

# Academic Program and Curriculum Syllabus

Department of Computer Networks and Software Techniques – Polytechnic College - Mosul / Northern Technical University

## 1. GENERAL AND HUMANITARIAN COURSES

### A. Human Rights and Democracy (Human Rights / NTU101)

2 Hours / Week (Theoretical)

- **Week 1:** Definition of human rights and their objectives in ancient civilizations, monotheistic religions, modern history, and regional and international conventions (European, American, African, Arab).
- **Weeks 4–6:** Non-governmental organizations (Red Cross, Amnesty International, Human Rights Watch), human rights in Iraqi constitutions and the Universal Declaration, economic, social, and modern rights (environment, solidarity), and guarantees for protecting human rights nationally and internationally.
- **Weeks 7–11:** General theory of freedoms: academic freedom, press, assembly, labor, property, the principle of equality and dealing with women, scientific progress and its impact on freedoms.
- **Weeks 12–15:** The crime of genocide, the concept and characteristics of democracy, elections and their types, and contemporary political systems.

### B. Arabic Language (Arabic Language / NTU103 & NTU202)

30 Total Hours (2 Hours / Week - Theoretical)

- Common linguistic errors, tied marbuta (ة) and open taa (ت).
- Rules of extended and shortened alef, solar and lunar letters.
- Distinction between Dad (د) and Dha (ذ), rules for writing Hamza, and punctuation marks.
- Distinction between noun, verb, and particle; types of objects (Mafa'eel); and rules governing numbers.
- Difference between Noon and Tanween, prepositions, administrative speech style, and drafting official correspondence and letters.

### C. Physical Education (Sport / NTU104)

30 Total Hours (2 Hours / Week - Theoretical & Practical)

- Importance of sports and their types, mechanics of body movement, and common sports injuries.
- Basic skills and international rules for basketball, table tennis, volleyball, swimming, lawn tennis, handball, track and field, and football.
- Management of sports championships and competitions, and sports legislation and regulations.

#### D. Crimes of the Baath Regime in Iraq (Crimes of the Baath Regime in Iraq / NTU203)

30 Total Hours (2 Hours / Week - Theoretical)

- Legal concept of crimes and their classifications according to the Iraqi Higher Criminal Court Law of 2005.
- Psychological and social crimes, militarization of society, and violations of national laws.
- Prisons and detention centers; environmental crimes: radioactive pollution, landmines, drying of the marshes, and destruction of orchards.
- Crimes of mass graves, genocide, and their chronological classification in Iraq.

## 2. BASIC AND SCIENTIFIC COURSES

#### A. Mathematics / Calculus (Mathematics / Calculus / NTU102)

2 Hours / Week

- **Matrices & Determinants:** Properties, algebraic operations, solving linear equations using Cramer's rule, and applications in electrical circuits.
- **Vectors:** Vector and scalar quantities, vector algebra, angular and coordinate dot/cross products, and applications in magnetic flux and Maxwell's theory.
- **Complex Numbers:** Algebraic operations, polar form, finding square roots, and solving quadratic equations.
- **Exponential & Hyperbolic Functions:** Graphing exponential functions and applications in electrical circuits.
- **Calculus (Differentiation):** Differentiation rules, chain rule, differentiation of trigonometric and logarithmic functions, implicit and higher-order derivatives, derivative applications (tangent, normal, velocity, acceleration).
- **Integration:** Indefinite integration, integration of algebraic, logarithmic, exponential, and trigonometric functions. Integration techniques: substitution, by parts, partial fractions. Definite integration and applications: areas under/between curves, numerical approximation using Trapezoidal and Simpson's rules.
- **Differential Equations:** Solving separable, homogeneous, and linear differential equations and their applications.

#### B. Computer Aided Engineering Drawing (Engineering Drawing)

3 Hours / Week (Theoretical & Practical)

- Fundamentals and usage of AutoCAD software: saving files, drawing sheet setup.
- Basic drawing commands: Line, Rectangle, Chamfer, Fillet, Move, Delete, Offset.
- Drawing circles, arcs, and polygons: Circles, Polygon, Rotate, Copy, Arc, Trim, Extend, Ellipse, Mirror.
- Adding dimensions and array configurations (Dimensions, Array).
- 3D Drawing and Engineering Projections (Isometric Drawings, Projections).

### 3. SPECIALIZED COMPUTER AND NETWORK COURSES

#### A. Computer Applications 1 & 2 (Computer / Computer 2 - NTU102 & NTU201)

2 Hours / Week

- **Windows Operating System:** Components, Start menu, Taskbar, Control Panel, shortcuts, and accessory programs.
- **DOS System:** Internal and external commands such as Move, Copy, Copy Con, Delete, VER, VOL, REN.
- **Search Engines & Internet:** Search techniques and methods for obtaining online help.
- **Word Processor (Microsoft Word):** Interface, creating/saving/previewing documents, text and paragraph formatting, bulleted and numbered lists, inserting tables, images, shapes, headers/footers, page numbers, symbols, and equations.

#### B. C++ Programming (Programming in C++ / CPN100)

5 Hours / Week (2 Theory + 3 Practical)

- Introduction to programming languages, difference between high-level and low-level languages, and setting up the development environment.
- **Variables & Data Types:** (int, float, char, string).
- **Operators:** Arithmetic, logical, relational operators, and statements.
- **Conditional Statements:** Control flow using if, else if, switch, and nested conditions.
- **Loops:** while, for, do-while, and nested loops for pattern generation and data processing.
- **Control Transfer Statements:** break, continue, goto.
- **Arrays:** 1D arrays, 1D strings, and 2D matrices.
- **Functions:** Function declaration, return values, compilers, and parameter passing for code organization.

#### C. Computer Architecture (Computer Architecture / CPN102)

5 Hours / Week (Theoretical + Practical)

- **Number Systems:** Conversions between systems and arithmetic operations inside computers.
- **Logic Gates:** Basic (AND, OR, NOT) and advanced (XOR, NAND, NOR).
- **Circuit Design:** Design of Combinational Circuits and Sequential Circuits (Flip-Flops, Registers).
- Simplification of logic expressions using Karnaugh Maps (K-Maps).
- Design of Half/Full Adders and Half/Full Subtractors.
- Design of Counters, Multiplexers, Demultiplexers, and basic memory circuits.
- Synchronous and asynchronous design; project: Mini Processor Unit.

#### **D. Computer Assembly and Maintenance (Computer Architecture / Assembly / CPN103)**

**5 Hours / Week (Theoretical + Practical)**

- Computer classification and identifying hardware/software safety requirements.
- Power Supply Unit (PSU) and Uninterruptible Power Supply (UPS).
- **Processor (CPU):** Performance factors, types, and operational flowcharts.
- **Motherboard:** Components, sockets, expansion slots, Northbridge & Southbridge.
- **Main & Secondary Memory:** RAM, ROM, Static/Dynamic Memory.
- **Storage Devices:** Floppy Disk Drive (FDD), Hard Disk Drive (HDD), Solid State Drive (SSD), and Optical Disk Drives (ODD).
- **Practical Assembly:** Installing motherboard, memory, drives, cabling, and expansion cards.
- **Ports & Buses:** (ISA, EISA, Serial, Parallel Ports); Computer viruses: types, propagation methods, and classification.

#### **E. Computer Network Fundamentals (Computer Networks / CPN105)**

**5 Hours / Week (Theoretical + Practical)**

- Fundamental concepts, network diagrams, reference models (OSI & TCP/IP), cabling types (Ethernet, Wi-Fi).
- Network types (LAN, WAN, MAN, WLAN, PAN, VPN) and Network Topologies.
- Internet communications, reliable networking, and security standards in data transmission.
- Network protocols and inter-layer communication.
- Standardization organizations for computer networks.
- Functions of the Physical Layer and signal transmission.
- Advanced routing protocols, wireless networks, and Software-Defined Networking (SDN).
- Future trends: Internet of Things (IoT) and Cloud-Network Computing.

#### **F. Internet of Things (Internet of Things / CPN107)**

**5 Hours / Week (Theoretical + Practical)**

- Core concepts of IoT, operation mechanisms, and data exchange between embedded devices.
- Common IoT devices, sensors, and technology stack layers.
- IoT hardware selection, wired networking, and Ethernet protocols.
- IoT messaging and communication protocols: MQTT and CoAP.
- Types of IoT networks and networking challenges.
- Data processing: Cloud Computing, Fog Computing, and Edge Computing.
- IoT applications, future developments, and security/privacy challenges.
- Data protection in IoT using Blockchain technology.

## CURRICULUM AND COURSE HOURS SUMMARY

| Course Title                       | Course Code     | Weekly Hours | Nature of Subject       |
|------------------------------------|-----------------|--------------|-------------------------|
| Human Rights and Democracy         | NTU101          | 2            | Theoretical             |
| Arabic Language                    | NTU103 / NTU202 | 2            | Theoretical             |
| Physical Education                 | NTU104          | 2            | Theoretical + Practical |
| Crimes of the Baath Regime         | NTU203          | 2            | Theoretical             |
| Mathematics / Calculus             | NTU102          | 2            | Theoretical             |
| Computer Aided Engineering Drawing | —               | 3            | Theoretical + Practical |
| Computer Applications 1 & 2        | NTU102 / NTU201 | 2            | Theoretical + Practical |
| C++ Programming                    | CPN100          | 5            | Theoretical + Practical |
| Computer Architecture              | CPN102          | 5            | Theoretical + Practical |
| Computer Assembly and Maintenance  | CPN103          | 5            | Theoretical + Practical |
| Computer Network Fundamentals      | CPN105          | 5            | Theoretical + Practical |
| Internet of Things (IoT)           | CPN107          | 5            | Theoretical + Practical |