# Course Content

**First Year First Semester**

| Course Code | Course Title | Credit |
|---|---|---|
| ICT 1101 | Basic Electrical Circuits | 3 |
| ICT 1102 | Basic Electrical Circuits Lab | 1 |
| ICT 1103 | Computer Programming | 3 |
| ICT 1104 | Computer Programming Lab | 1 |
| ICT 1105 | Physics | 3 |
| ICT 1107 | Differential and Integral Calculus | 3 |
| ICT 1109 | Chemistry | 3 |
| | Total | 17 |

| ICT 1101 | Basic Electrical Circuits | 3 |
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| **Network Circuit and Analysis:** Fundamental electric concepts and measuring units, D.C. voltage, D.C Current, Resistance and power, dependent and independent sources, Series, Parallel, Series-Parallel circuits, Open and short circuits, Star-Delta conversion. | | |
| **Networks Theorems:** Superposition theorem, Thevenins theorem, Norton's theorem, Maximum Power Transfer theorem, Millman's theorem. | | |
| **Basic Passive Elements:** Resistor, Capacitor and Inductors in series and parallel, Transient in capacitive network, charging phase and discharging phase, RLC circuits. | | |
| **Magnetic circuits:** Introduction to magnetic circuits, Solution of magnetic circuits, Hysteresis and eddy current losses. | | |
| **Fundamental of AC and the basic elements and phasor:** Generation of the ac voltage and current; The sine wave; General format of sinusoidal voltage and currents; Phase and Algebraic representation of sinusoids; Average and RMS value; Frequency Response of the Basic elements; Average Power and Power factor; Complex Numbers: Rectangular and Polar form; Series and Parallel ac circuits; Series-Parallel ac circuits. | | |
| **Resonance:** Series and Parallel resonant circuit, Selectivity, Quality Factor. | | |
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| Reference | | |
|---|---|---|
| 1. | Introductory Circuit Analysis | Robert L. Boylested |
| 2. | Fundamentals of Electric Circuits | Charles K. Alexander, Matthew N. O. Sadiku |
| 3. | Electrical Circuits | W. Nilson & S.A. Riedel |
| 4. | Principles of Electric Circuits | Thomas L Floyd |

| ICT 1102 | Basic Electrical Circuits Lab | 1 |
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| Based on the course contents of ICT 1101, Basic Electrical Circuits. | | |

| ICT 1103 | Computer Programming | 3 |
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| **Introduction:** Data type, variables, operators, expressions, type-casting; Control structure: if-else, switch-case, ternary operator, while/do-while/for loops, nested control structure, break and continue; | | |
| **Function:** parameter passing, return type; One-dimensional array: searching and sorting with one dimensional arrays; **Character and string:** basic string operations, string related library functions; | | |
| **Multi-dimensional array:** Matrix operations with multi-dimensional arrays; Recursion; Bitwise operations; User-defined data types: structure, union, bitfield, enumeration; | | |

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| Pointers: pointer to string, array, structure, and function, dynamic memory allocation; Input/Output (I/O): console I/O, formatted I/O, file I/O, command line arguments; Header files and preprocessors; Variable argument function; Error handling. |
| Reference language: C. |

| Reference | | |
|---|---|---|
| 1. | The C Programming Language | Brian W. Kernighan; Dennis M. Ritchie |
| 2. | C: The Complete Reference | Herbert Schildt |
| 3. | C Programming in easy steps | Mike McGrath |
| 4. | Head First C: A Brain-Friendly | David Griffiths; Dawn Griffiths |

| ICT 1104 | Computer Programming Lab | 1 |
|---|---|---|
| -Based on the course contents of ICT 1103, Computer Programming. | | |

| ICT 1105 | Physics | 3 |
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| Structure of Matter: Crystalline and amorphous solids, crystal systems, crystal directions, Miller indices, co-ordinations number, packing factor, Bragg's law of X-ray diffraction, crystal structure analysis, defects in crystal, bonds in solids, cohesive energy and bonding energy, free electron theory of metals, band theory of solids, solid state devices; | | |
| Electricity and Magnetism: Electrostatics: Electric field, Gauss's law and its applications for various charge distributions, electric potential and equipotential surface, dielectrics and electrostatic energy in capacitors; Magnetostatics: Magnetic field and forces, Hall effect, application of Biot-Savart and Ampere's laws, electromagnetic induction and inductance, energy in a magnetic field, Electromagnetic oscillations: RC, LR, LC and LRC circuits, working principle of transformers, motors and generators, Magnetic materials and its applications in a computing device; | | |
| Wave Mechanics: Failure of classical mechanics and historical origins of the quantum mechanics, wave particle duality, uncertainty principle, postulates of quantum mechanics, wave function, operators, Schrödinger equation, expectation value, Ehrenfest theorem, Eigen function and Eigen values, particle in a box, square well potential, linear harmonic oscillator. | | |

| Reference | | |
|---|---|---|
| 1. | Fundamentals of Physics | Halliday, Resnick, Walker |
| 2. | Physics for Engineers | Gias Uddin Ahmed |
| 3. | Concepts of Modern Physics | Arthur Beiser |
| 4. | Physics for Scientists and Engineers | Raymond A. Serway, John W. Jewett |

| ICT 1107 | Differential and Integral Calculus | 3 |
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| Differential Calculus: Continuity and differentiability; Successive differentiation: Leibnitz's forms; Maxima and minima of functions of single variable: Rolle's theorem, mean value theorem; Evaluation of indeterminate forms by L'Hospital's rule; Expansion of functions: Taylor's and Maclaurin's theorems, Lagrange's and Cauchy's forms of remainders; Partial differentiation, Euler's Theorem; Tangent, normal.; | | |
| Integral Calculus: Definite integrals and its properties; Wallis' formula; Improper integrals; Beta function and Gamma function; Parametric equations and polar coordinates; Applications of Integration: area under a plane curve, area of a region enclosed by two curves and arc 10 lengths in Cartesian and polar coordinates, volume and surface area of solids of revolution; Multiple integrals. | | |
| Implement in computer program. | | |

| Reference | | |
|---|---|---|
| 1. | Engineering Mathematics | K.A. Stroud |
| 2. | Advanced Calculus | M. R. Spiegel |

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| 3. | Calculus with Analytic Geometry | Earl W. Swokowski |
| 4. | Advanced Engineering Mathematics | Erwin Kreyszig |

| ICT 1109 | Chemistry | 3 |
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Quantum concept in atomic structure, VSEPRT; molecular geometry, Quantum concept in bonding; VBT and MOT, Frontier MOT and electronic transition;

Silicon chemistry, Properties of solutions, Colloid and Nanochemsitry, Phase rule and phase diagram; Energy and chemistry;

Electrochemistry; electrolytic conduction, corrosion, devices for energy storage, Chemistry of biodegradable and conductive polymer; LED, LCD/touch screens;

Chemistry of proteins, nucleic acids (DNA, RNA), carbohydrates and lipids;

Introduction to computational chemistry; Design of new molecules, materials and drug design.

Reference

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|---|---|---|
| 1. | Modern Chemistry | Jerry L. Sarquis and Mickey Sarquis |
| 2. | Protein Chemistry | Lars Backman |
| 3. | Computational Chemistry | Errol G. Lewars |
| 4. | Nanochemistry | Ludovico Cademartiri, Geoffrey A Ozin, André Arsenault |