

**Mawlana Bhabhasni Science and Technology University (MBSTU)**  
**Santosh, Tangail**  
**Department of Information and communication Technology (ICT)**  
*Session: 2004-05*  
**Total Credit: 148**  
**(1 Credit = 14 Hours)**

**First Year First Semester**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-101	Basic Electrical Circuit	3.00	00.00	3.00
ICT-102	Basic Electrical Circuit Lab	00.00	2.00	1.00
ICT-103	Computer Programming	3.00	00.00	3.00
ICT-104	Computer Programming Lab	00.00	2.00	1.00
ICT- 105	Introduction to Information Technology	2.00	00.00	2.00
ICT- 106	Introduction to Information Technology Lab	00.00	2.00	1.00
MATH-107	Mathematics-I	3.00	00.00	3.00
	Option I	3.00	00.00	3.00
		<b>14.00</b>	<b>6.00</b>	<b>17.00</b>

**Option I (select any one)**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
SOC-111	Sociology	3.00	00.00	3.00
ES-113	Environmental Science	3.00	00.00	3.00

**First Year Second Semester**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 115	Discrete Mathematics	3.00	00.00	3.00
ICT- 117	Electronics-I	3.00	00.00	3.00
ICT- 118	Electronics-I Lab	00.00	2.00	1.00
PHY-119	Physics	3.00	0.00	3.00
ICT-120	Software Development Project-I	0.00	2.00	1.00
MATH- 121	Mathematics-II	3.00	00.00	3.00
STA- 123	Statistics	2.00	00.00	2.00
ENG- 125	English	3.00	00.00	3.00
		<b>17.00</b>	<b>4.00</b>	<b>19.00</b>

## Second Year First Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 201	Data Structure & Algorithm	3.00	00.00	3.00
ICT- 202	Data Structure & Algorithm Lab	00.00	2.00	1.00
ICT- 203	Digital Electronics	3.00	00.00	3.00
ICT- 204	Digital Electronics Lab	00.00	2.00	1.00
ICT-205	Object Oriented Programming	3.00	00.00	3.00
ICT-206	Object Oriented Programming Lab	00.00	2.00	1.00
MATH- 207	Mathematics-III	3.00	00.00	3.00
AF-209	Financial and Managerial Accounting	3.00	0.00	3.00
		<b>15.00</b>	<b>6.00</b>	<b>18.00</b>

## Second Year Second Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 211	Electronics-II	3.00	00.00	3.00
ICT- 213	Microprocessor and Assembly Language	3.00	00.00	3.00
ICT-214	Microprocessor and Assembly Language Lab	00.00	2.00	1.00
ICT- 215	Computer Based Numerical Methods	3.00	00.00	3.00
MATH- 217	Mathematic- IV	3.00	00.00	3.00
ICT-218	Software Development Project-2	00.00	2.00	1.00
ECON-219	Economics	3.00	00.00	3.00
BM-221	Bio-Medical Science	3.00	00.00	3.00
		<b>18.00</b>	<b>4.00</b>	<b>20.00</b>

### Third Year First Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 301	Computer Architecture	3.00	00.00	3.00
ICT-303	Communication Engineering-I	3.00	00.00	3.00
ICT- 305	Database Management Systems	3.00	00.00	3.00
ICT- 306	Database Management Systems Lab	00.00	2.00	1.00
ICT-307	Operating System	3.00	00.00	3.00
ICT-308	Operating System lab	0.00	2.00	1.00
ICT- 309	Computer Peripherals and Interfacing	3.00	00.00	3.00
ICT- 310	Computer Peripherals and Interfacing Lab	00.00	2.00	1.00
		<b>15.00</b>	<b>6.00</b>	<b>18.00</b>

### Third Year Second Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 311	Microwave Engineering	3.00	00.00	3.00
ICT- 312	Microwave Engineering Lab	00.00	2.00	1.00
ICT-313	Data Mining	3.00	00.00	3.00
ICT- 315	Computer Network	3.00	00.00	3.00
ICT- 316	Computer Network Lab	00.00	2.00	1.00
ICT- 317	Object Oriented Analysis and Design	3.00	00.00	3.00
ICT- 318	Object Oriented Analysis and Design Lab	00.00	2.00	1.00
ICT- 319	Software Engineering	3.00	0.00	3.00
	Option-III	3.00	00.00	3.00
		<b>18.00</b>	<b>6.00</b>	<b>21.00</b>

### Option III(select any one)

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-321	VLSI design	3.00	00.00	3.00
ICT-323	Bio-Informatics	3.00	3.00	3.00

### Fourth Year First Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 401	Telecommunication Engineering	3.00	00.00	3.00
ICT- 403	Artificial Intelligence	3.00	00.00	3.00
ICT- 404	Network Design Lab	00.00	2.00	1.00
ICT-405	Network Security	3.00	00.00	3.00
	Option-IV	3.00	00.00	3.00
	Option-IV Lab	00.00	2.00	1.00
	Option-V	3.00	00.00	3.00
ICT-500	Research Project	00.00	4.00	2.00
		<b>15.00</b>	<b>8.00</b>	<b>19.00</b>

#### **Option-IV(select any one with lab)**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-407	E-commerce and Web Programming	3.00	00.00	3.00
ICT-408	E-commerce and Web Programming Lab	0.00	2.00	1.00
ICT-409	Multimedia	3.00	00.00	3.00
ICT-410	Multimedia Lab	0.00	1.00	1.00

#### **Option-V(select any one)**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-411	Simulation and Modeling	3.00	00.00	3.00
ICT-413	E-governance	3.00	00.00	3.00

### Fourth Year Second Semester

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT- 415	Digital Signal Processing	3.00	00.00	3.00
ICT- 416	Digital Signal Processing Lab	00.00	2.00	1.00
ICT-417	Communication Engineering-II	3.00	0.00	3.00
ICT- 419	Optical Communication	3.00	00.00	3.00
ICT- 420	Optical Communication Lab	00.00	2.00	1.00
	Optional-VI	3.00	00.00	3.00
ICT-500	Research Project	00.00	4.00	2.00
		<b>12.00</b>	<b>8.00</b>	<b>16.00</b>

#### **Option-VI(select any one)**

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-421	Cyber Law	3.00	00.00	3.00
ICT-423	Client-Server Technology	3.00	00.00	3.00

## First Year First Semester

**ICT-101      *Basic Electrical Circuit*      *Credit: 3.00***

**Network Circuit and Analysis:** Fundamental electric concepts and measuring units, D.C. voltage, D.C Current, Resistance and power, Series, Series-Parallel circuits, Open and short circuits, Star-Delta conversion.

**Networks Theorems:** Superposition theorem, Thevenins theorem, Norton 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;

**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;

**ICT- 102      *Basic Electrical Circuit Lab*      *Credit:1.00***

Laboratory works based on ICT-101.

**ICT- 103      *Computer Programming*      *Credit: 3.00***

Structured programming concepts. Writing, debugging and running programs using C : Variables, Arithmetic expressions, Types, Operators and Expressions, Control flow, Functions and Program structures. Pointers and Arrays, Structures, Files, Input / Output Systems in C, Graphics.

**ICT- 104      *Computer Programming Lab*      *Credit: 1.00***

Laboratory works based on ICT- 103.

**ICT- 105      *Introduction to Information Technology*      *Credit: 2.00***

What is information Technology? How information Technology related to computer science? Computer Organization, How computers works for information processing. Number System: Binary, Octal & Hexadecimal; Addition, Subtraction, Multiplication and Division; Codes: BCD, Excess three & Gray Codes; Error detecting Codes and Error Correcting Codes. Computer hardware: Input output devices. Computer memory and memory components. Databases are a key information technology. They're central to process automation, reporting, and decision support. Role of software for information processing. Types of software, system software, introducing computer languages, machine language, assembly language, High-level language, language, language translator-interpreter, compiler and assembler, system utilities, Application software. Introduction, function, and types of operating system. Basic structure of distribution of information in network environment

**ICT- 106      *Introduction to Information Technology lab*      *Credit:1.00***

Laboratory works based on ICT- 105.

**MATH- 107      *Mathematics I*      *Credit: 3.00***

Differential Calculus :

Limit. Continuity and differentiability. Differentiation of explicit and implicit function and parametric equation, Significance of derivatives. Differentials. Successive differentiation of various types of function. Leibnitz's theorem. Rolle's theorem, Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainder. Expansion of functions by differentiation and integration, Partial differentiation, Euler's theorem. Tangent, Normal, Sub-tangent and subnormal in Cartesian and polar coordinates, Determination of maximum and minimum values of functions and points of inflection, Applications, Evaluation of indeterminate forms by L'Hospital's rule, Curvature, Circle of curvature, center of curvature and chord of curvature, Evolute and involute, Asymptotes, Envelopes, Curve tracing.

Integral Calculus

Definitions of integration, Integration by method of substitution. Integration by parts, Standard integrals, Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Wallis's formulae. Improper Integrals, Beta function and Gamma function. Area under a plane curve in Cartesian and Polar co-ordinates. Area of the region enclosed by two curves in Cartesian and Polar co-ordinates. Arc lengths of curves in Cartesian and Polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

**Option I (Select any one):**

**SOC-111      *Sociology*      *Credit: 3.00***

Bureaucracy as an organ of modern state, Marxism, Power Authority, Pressure Group.

What is Sociology? Nature & Scope of Sociology. Development of Sociology, Relation with ICT.

Primary Concept: Society, Community, Association, and Institution. Culture: Components of Culture, norms, values, folkways, mores, custom, fashion etc., Culture & Civilization Types of Society: Orientate & Occidental Society.

Social Institution: Family, Religion. Social Stratification & Mobility: functionalist & Conflict Perspective

Social change: Theories of social change

Social Structure: Components of social Structure

Bhashani Ethics:

**ES-113      *Environmental Science*      *Credit: 3.00***

**Introduction to Environmental Science:** Definition and Scope of Environmental Science, Historical Development, Environmental Science, components of

**Ecology and the Environment:** Concept of ecosystem and ecology (Definition, scope and relationship), Principle and concept of partitioning the ecosystem, Food chain, food webs, trophic level, Development and evolution of ecosystem

**Environmental Pollution:** General concept of environmental pollution  
Air pollution- Types and sources of air pollution and their effects on health and environment, Water pollution-Types and sources and causes of noise pollution, and their effects on environment, Noise pollution-Sources and causes of noise pollution, their effects on human health

**Environmental Management:** Principles and objectives of environmental conservation, Environment and sustainable development- impact of development on environment, Environment Assessment- Environmental Impact of Assessment (EIA), Environmental Management Plan (EMP), Initial Environmental Examination (IEE), Environmental Law and Policy of Bangladesh.

### First Year Second Semester

**ICT-115**      **Discrete Mathematics**      **Credit: 3.00**

**Mathematical logic:** Propositional calculus, Predicate calculus. Set theory: Sets, Relations, Partial Ordered Sets, Functions.

**Graph theory:** Graphs, Paths, Trees, Algebraic Structures: Binary operations, Semigroups, Groups, Permutation Groups, Rings and Fields, lattices.

**ICT- 117**      **Electronics-I**      **Credit: 3.0**

Energy Bands in solids, Transport Phenomena in Semiconductor, Semiconductors diodes, Junction diode characteristics and applications, Schottky Barrier Diodes, Varactor Diodes, Photo Diodes, Power diodes, LCD, Bipolar transistor characteristics, DC Biasing BJTs, Small-signal low frequency h-parameter model, hybrid pie model, Field Effect Transistors, FET Biasing;

**ICT- 118**      **Electronics-I Lab**      **Credit: 1.00**

Laboratory based on the course ICT-115

**PHY-119**      **Physics**      **Credit: 3.00**

#### Heat and Thermodynamics

Change of state, Latent heat of Fusion, Laws of Fusion, Kinetic Theory of Matter, Ideal gas, Kinetic theory of gases: Expression for the pressure of a gas, Kinetic Interpretation of Temperature, Maxwell's law of equipartition of energy, Vander Waals equation of state, Critical constants, Coefficient of Vander Waals Constant, Properties of matter near critical point. Laws of thermodynamics: First law of thermodynamics, Specific heats of gases.

#### Wave and Oscillation

Oscillation: Simple harmonic motion, Combination of S.H.M. and Lissajous

membranes and columns. Waves: Traveling waves, the principle of superposition, Wave velocity, Group velocity and phase velocity, Power and intensity in wave motion, Interference of waves, Diffraction of waves, Standing waves. Sound waves: Audible, Ultrasonic, Infrasonic and Supersonic waves; Propagation and speed of longitudinal waves, Traveling longitudinal waves, Standing longitudinal waves, Vibrating systems and sources of sound, Beats, The Doppler effect.

Electricity & Magnetisms

Electronics: Charge & Matter, Coulomb's Law, The Electric Field, The electric field strength, Line of force, A dipole in an electric field, Gauss's Law, Gauss's law and Coulomb's law, Electrical Potential, Capacitance & Resistance, Ohmic & non Ohmic material.

Electromagnetism: Magnetic fields, Magnetic Force on a current, The Hall effect, Maxwell's Equations. Ampere's law, the Biot-Savart Law, Farady's Law, Lenz's law.

**ICT- 120      *Software Development Project-I*      **Credit: 1.00****

Students will develop a project work assigned by course teacher.

**MATH-121      *Mathematics-II*      **Credit: 3.00****

Co-ordinate Geometry

Co-ordinate Geometry of two dimensions: Change of axes, Transformation of co-ordinates, simplification of equations of curves. Co-ordinate Geometry of three dimensions: System of co-ordinates. Distance of two points, Section formula, Projection. Direction cosines. Equations of planes and Lines.

Ordinary Differential Equations

Degree and order of ordinary differential equations. Formation of differential equations. Solutions of first order differential equations by various methods. Solutions of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equation. Solution of differential equations of the higher order when the dependent of independent variables are absent.

**STA-123      *Statistics*      **Credit: 2.00****

Frequency distribution. Mean Median Mode and other measure of central tendency. Standard deviation and other measures of dispersion. Moments. Skewness and Kurtosis. Elementary probability theory, Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

Probability distribution and expectations, discontinuous probability distribution, e.g. normal and exponential. Stochastic processes, discrete time Markov chain and continuous time Markov Chain, Birth-death process in queuing.

**ENG-125      *English*      **Credit: 3.00****

English phonetics: The place and manners of articulation of the English sounds,





statements, recursion, Arrays and strings, pointers, Advanced data types, access modifiers, pointer to function, dynamic memory allocation, User defined data types, advanced operators. Object oriented programming: Concepts of object oriented programming, objects, polymorphism, inheritance, OPP with C++, Classes, parameterized constructors, friend functions, multiple inheritance, passing object to functions, arrays of objects, pointer to objects,. Function and operator overloading, overloading constructor functions, references, Inheritance, virtual functions and polymorphism, C++'s I/O class library, C++ streams, creating insertors and extractors, formatting I/O, file I/O, Dynamic allocation using new and delete, Static class members, C++'s complex and BCD classes, the message based philosophy, using C++'s memory model, Using VROOMM overlay technology, Using command line compiler, compiling multiple file program.

### **JAVA**

Introduction to Java, Concept of classes and objects, Features of Object Oriented Programming, Java Applications, Java Applets, Control Structures and Arrays, Methods, Object Based Programming, Object-Oriented Programming: Encapsulation, Inheritance, Polymorphism, Overriding, Overloading. Graphics, Graphical User Interfaces, Data structure, Multimedia: Images, Animation, and Audio Exception Handling, Multithreading, Files and Streams, Java Database Connectivity (JDBC).

**ICT- 206      *Object Oriented Programming Lab*      *Credit: 1.00***

Laboratory words based on ICT-205

**MATH-207      *Mathematics-III*      *Credit: 3.00***

**Vector Analysis:** Definition of vectors. Equality of vectors. Addition and multiplication of vectors. Linear dependence and independence of vectors. Differentiation of vectors together with elementary applications. Definitions of line, surface and volume integrals. Gradient of a scalar function. Divergence and curl of a vector function. Physical significance of gradient, divergence and curl. Various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem and Gauss's theorem.

**Matrix:** Definition of matrix, equality of two matrices. Addition, Subtraction and multiplication of Matrices. Transpose of matrices and inverse of matrix and Rank of matrices.

**AF-209      *Financial and Managerial Accounting*      *Credit: 3.00***

### **Financial Accounting:**

Objectives and importance of accounting; Accounting as an information system; Recording system: double entry mechanism; accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions.

### **Cost and Management Accounting:**

Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis.

Short-term investment decisions: relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

## **Second Year Second Semester**

***ICT-211      Electronics-II      Credit: 3.00***

Power Amplifiers, Differential Amplifiers, Operational amplifiers and applications: Linear application of op-amp, gain, input and output impedances, frequency response, Feedback and Oscillators circuits: Colpitts, Hartley, Wine Bridge, Crystal, Sinusoidal. Feedback Amplifiers, Voltage regulators, Multivibrators, Comparators and Converters, Different types Active filters: Butterworth filters, Band-pass filters, Band Reject Filters, All pass Filters.

***ICT- 213      Microprocessors and Assembly language      Credit: 3.00***

Machine and assembly language programming, Introduction to different types of microprocessors, Architecture, Instruction Format, Instruction Sets, Opcode, Processor status and Flag registers, Addressing modes, Branching and Looping, Interrupt structures, I/O operation, I/O interfacing, DMA. Assembly language program writing, debugging and execution. Programming in Microcomputers, Subroutine and reentrant programs, and Disk file handling.

Hardware and Software Interfacing in Microcomputer System Design, I/O Design and Total System Design, Microprocessor based system design: Hardware design, Building, Debugging, Testing and Linking program modules, Programming EPROM. Multiprocessor configurations: coprocessor configuration, Numeric data processor, I/O processors, Advanced Microprogramming: Bit-Slice Microprocessor, Parallelism in Microprocessor.

***ICT-214      Microprocessors and Assembly language Lab      Credit: 1.00***

Laboratory words based on ICT-213

***ICT-215      Computer based Numerical Methods      Credit: 3.00***

Computational methods for solving problems in linear algebra, linear programming, nonlinear equations, approximations, iterations, methods, of least squares.

Interpolations, integration and ordinary differential equations.

**MATH- 217 Mathematics-IV**

**Credit: 3.00**

**Complex Variable:** Complex number system, General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue, Cauchy's residue theorem.

**Differential Equations:** Solution of differential equation by the method based on the factorization of the operators. Frobenius method. Bessel's and Legendre's differential equations. Partial Differential Equations : Partial differential equations. Wave equations. Particular solutions with boundary and initial conditions.

**ICT-218 Software Development Project-II**

**Credit: 1.00**

Students will develop a project work assigned by course teacher.

**ECON-219 Economics**

**Credit: 3.00**

Nature of the economic theory, applicability of economic theories to the problem of developing countries. Some basic concepts - supply, demand and their elasticities. The relationship among average, margin and total and their derivation. Equilibrium- stable, static and dynamic equilibrium. Consumer's equilibrium-indifference curve, producer's equilibrium- isoquant.

Production- factors of production, production possibility curve- equilibrium of a firm, fixed cost and variable cost, the short run and the long run. The cost curves and supply curves, law of returns, internal and external economics and diseconomies. Economics of development and planning, basic concept- saving, investment, GNP, NNP, percapita income, growth rate, policy instruments of development. Fiscal policy, monetary policy and trade policy their relative applicability in Bangladesh. Some planning tools- capital output ratio, input analysis, planning in Bangladesh- five year plans of Bangladesh, development problems related to agriculture, industry and population of Bangladesh.

**BM-221 Bio-Medical Science**

**Credit: 3.00**

Overviews of cellular structure and cellular metabolism, various cellular organelles, several aspects of cell biology: membrane transport, cellular signaling, neurotransmission, cell division and cellular death, genetics and genomic, principles of drug action, synopsis of microbiologic principles and the Pharmacology of antibiotic drugs. The human body is invaded by a multitude of microorganisms such as viruses, prokaryotic bacteria, and eukaryotic fungal and animal parasites. Understanding how these organisms differ from human cells and how they function to cause disease is integral to the intelligent practice of medicine.

## Third Year First Semester

**ICT-301      *Computer Architecture*      *Credit: 3.00***

Introduction to Computer Hardware and Software. Addressing Methods and Machine level Instructions. Instruction Sets. Central Processing Unit, Arithmetic and Logical processing unit, Micro programmed control unit.

Interrupts, DMA, Memory Organization, Computer peripherals, Von Neuman SISD organization. RISC and CISC Machines.

**ICT-303      *Communication Engineering-I*      *Credit: 3.00***

**Information Theory:** Basic concept of information; Entropy; Information rate; channel capacity and coding, Huffman code.

**Analog Modulation:** Amplitude Modulation, Generation & Demodulation of AM waves, DSBSC waves, Coherent Detection of DSBSC Signal, Quadrature-Carrier Multiplexing, Generation of SSB waves, Demodulation of SSB waves.

**Angle Modulation:** Frequency & phase Modulation, narrow & Wide-Band FM, BW of FM waves, Generation & Demodulation of FM waves, S/N ratio, Comparison of AM, FM & PM.

**Pulse analog Modulation:** Sampling theorem, Sampling of Low Pass and band pass signals, Aliasing, Aperture effect, PAM, PWM and PPM generation and demodulation, TDM, Cross talk, Spectral analysis of PAM, PWM and PPM Waves, S/N ratio for different pulse modulation.

**Pulse-Digital Modulation:** Pulse Code modulation signal to quantization noise ratio, Companding, probability of error for PCM in AWGN Channel, DPCM, DM and ADM modulators and demodulators, Prediction Filter, line coding, Inter symbol Interference. Digital transmission through Carrier Modulation

Amplitude, Frequency and phase shift keying, Differential phase shift keying, CPFSK, MSK QPSK and QAM modulation & detection, probability of error calculation, Matched Filter.

**ICT-305      *Database Management Systems*      *Credit: 3.00***

Database Concepts: Files and Databases, Database Management Systems, Data Models. Relational Data Model: Relations, Domains, Attributes, and Tuple, Anomalies, Functional Dependency, First, Second, and Third Normal Forms, Boyce-Codd Normal Form, Relational Calculus Based Languages – SQL and QBE, Relational Algebra and Set Operations. Relational Database Design: Relational Design Criteria, Lossless Decompositions, Decomposition Algorithms, Synthesis Algorithms

Advanced Database Concepts: Fourth and Fifth Normal Forms, Object-Oriented Databases. Entity-Relationship (ER) Approach: The ER Model and Its Constructs, ER Modeling in Logical Database Design, Transformation of the ER Model to SQL, Distributed Database Design. The MAM Technique: Fact Types, Uniqueness Constraints, Arity Checking, General Constraints, Conceptual Schema Transformations, Relational Implementation.

**ICT-306      *Database Management Systems Lab*      *Credit: 1.00***

Laboratory works based on ICT-305

**ICT- 307      *Operating System*      *Credit: 3.00***

Evolution of Operating Systems: Early Operating Systems, Improvements in System Utilization, Spooling, Interrupts and Interrupt Handling. Multiprogramming and Time Sharing: Sharing of Space and Time, Protection and Integrity.

Operating system concept: Introduction to operating system structure; Types of operating system.

Process: Introduction to process; Sequential Processes; Concurrent Process; Cooperating Process; Communicating Processes; Process Control; Process Scheduling.

Input-Output Management: Management of I/O hardware; Principles of I/O software; Deadlocks; RAM disks.

Memory management: Swapping; Paging; Segmentation; Paging Algorithms.

File systems: File structure; File directories, File system; Security and protection techniques; Shared file and file server.

Design and Implementation: Methodology; Performance evaluation; Case studies include UNIX, MINIX, MD-DOS, WINDOWS etc.

Distributed system: Definition; Architecture; Networking; Networking protocols; Case studies.

**ICT- 308      *Operating System Lab*      *Credit: 1.00***

Laboratory works based on ICT-307

**ICT-309      *Computer Peripherals and Interfacing*      *Credit: 3.00***

Interfacing Techniques: Interfacing for memory, Communication System; System Overhead (DMA and programmed data transfer); I/O ports and Controls; Parallel and serial Interfacing devices; Timing Considerations; Noise considerations; Application of PPI, PCI, DMAC, PIC etc;

**ICT-310      *Computer Peripherals and Interfacing Lab*      *Credit: 1.00***

Laboratory works based on ICT-309

### **Third Year Second Semester**

**ICT-311      *Microwave Engineering*      *Credit: 3.00***

**Maxwell's Equation:** The equations of stationary electric and magnetic field; continuity of charge and concept of displacement current; Maxwell's equation in differential, integral and time periodic case and their derivations; formulation of circuit concept consistent with Maxwell's equation; Maxwell's equation and plane wave; pointing theorem; continuity conditions for ac fields; penetration of electromagnetic fields into a good conductor; internal impedance of a plane

potentials for time varying fields; the retarded potentials as integral over charges and currents; the retarded potentials for the time periodic case.

**Microwave devices:** Microwave triodes, Multi-cavity Klystron, Reflex Klystron; Magnetron, Traveling wave tube; other microwave tubes.

**Wave guide:** Introduction, solution of wave equation in rectangular coordinate, TE and TM modes in rectangular wave guides, Power transmission and power load in rectangular waveguides, solution of wave equation in cylindrical coordinates, TE, TM, and TEM modes in circular wave guides, Power transmission and power loss in circular wave guides.

**Antenna:** The radiation mechanism; systemization of calculation of radiating fields and power from current on an antenna; antenna gain; antenna resistance, bandwidth, beam width and polarization; long straight wire antenna; wire antenna; half wave dipole; antenna; above earth of conducting plane; Loop antenna; linear arrays; Yagi-uda arrays.

**ICT-312**      **Microwave Engineering lab**      **Credit: 1.00**

Laboratory works based on ICT-311

**ICT-313**      **Data Mining**      **Credit: 1.00**

The nature and structure of data, Data preparation, Specifying data mining tasks, Classification and decision trees, Bayesian classification, Classification with neural networks, Prediction and other classification techniques, Cluster analysis and distance measures, Partition clustering, Hierarchical clustering, Probability based clustering, Association rule mining, Apriori algorithm, Frequent pattern growth algorithm, Correlation and other interestingness measures, Detailed course will be included later on. Spatial Aggregation (SA). Closing-the-Loop. Sampling Strategies. Feature Extraction. Identifying Relevant Features. Model Assessment. Bayesian Model Inference and Averaging.

**ICT-315**      **Computer Network**      **Credit: 3.00**

**Introduction:** Basic computer network concept; network structure; network software; reference model; example networks; X.25 networks.

**Physical Layer:** transmission media; narrow band ISDN; Broad band ISDN and ATM.

**Data link Layer:** Data Link Layer Design issues; Error detection and correction; Elementary data link protocols; sliding window protocols; example data link protocols.

**Medium Access sub Layer:** Multiple access protocols; ALOHA; CSMA/CD protocol; Collision free protocols; Limited contention protocol; wavelength division multiple access protocols; wireless LAN protocols: IEEE standard 802 for LANs and MANs; Bridges; High speed LANs; satellite networks.

**Network Layer:** Network layer design issues; Routing algorithms; congestion control algorithms; internetworking ;network layer in the internet; network layer in ATM networks.

Transport layer: the transport service; Elements of transport protocols; the internet transport protocols; the ATM AAL layer protocols;

Application layer: Network security; DNS; SNMP: simple network Management protocol; Electric mail; The world wide web; Multimedia.

**ICT-316      Computer Network lab      Credit: 1.00**

Laboratory works based on ICT-315

**ICT-317      Object Oriented Analysis and Design      Credit: 3.00**

**Complexity:** The inherent Complexity of Software, The Structure of Complex Systems, Bringing Order to Chaos, On Designing Complex Systems;

**The Object Model:** The Evolution of the Object Model, Elements of the Object Model, Applying the Object Model;

**Classes and Objects:** The Nature of an Object, Relationship Among Objects, The Nature of a Class, Relationships Among Class, The interplay of Classes and Objects, On building Quality Classes and Objects, Sidebar: Invoking a method.

**Classification:** The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms;

**The Method:** The Nation: Elements of the Nation, Class Diagrams, State Transition Diagrams, Object Diagrams, Interaction Diagrams, Module Diagrams, Process Diagrams, Applying the Nation.

**The Process:** First Principles, The Micro Development Process.

**Pragmatics:** Management and Planning, Staffing, Release Management, Reuse, Quality Assurance and Metrics, Documentation, Tools, Specials Topics, The Benefits and Risks of Object-Oriented Development.

**Data Acquisition:** Weather Monitoring Station Analysis, Design, Evolution, Maintenance, Sidebar: Weather Monitoring Station Requirements.

**Command and Control:** Traffic Management: Analysis, Design, Evolution, Maintenance.

**Different type methodology, UML.**

**ICT-318      Object Oriented Analysis and Design Lab      Credit: 3.00**

Laboratory works based on ICT-317

**ICT-319      Software Engineering      Credit: 3.00**

Software, Its Nature and Qualities. Software Engineering Principles: Rigor and Formality, Separation of Concerns, Modularity, Abstraction, Incrementally. The Software Process: Process Models, Planning, Cost Estimation and project Control, Software Design, Modularization: Structure, Representation, Interface and Information Hiding, Design Notations, Object-Oriented Design: Object Paradigm, Introduction to a Specific Object-Oriented Design Technique

Software Specification, Operational Specification: Semi-Formal Schemes, Asynchronous Systems: Petri Nets. Descriptive Specifications: Traditional Schemes, ER Model and Logic, Introduction to a Formal Scheme (Z). Software Verification, Software Testing, Software Tools and Environments.

**Option III (Select any one):**

**ICT- 321      VLSI DESIGN      Credit: 3.00**

Introduction to microelectronics and MOS technology, Basic electrical properties and circuit design processes of MOS and BiCMOS circuits, Scaling of MOS circuits, Subsystem design Processes and layout.

Computational elements: Design of an ALU subsystem Adder Multipliers



and testability, CMOS design: behavioral description, structural description, physical description and design verification, Introduction to GaAs technology: Ultra-fast VLSI circuits and systems.

**ICT- 323      *Bio-Informatics*      *Credit: 3.00***

Review of DNA, Transcription, Translation, Protein Structures, Amino Acids, etc. General Introduction to Genomics and Proteomics Methods. BLAST, Advanced BLAST, Psi-BLAST, Phi-BLAST. Motif searches. Prosite, Profilescan. How to submit a sequence to Genbank (BankIt, SeqIn). Navigating the NCBI web site. Genbank, EMBL, OMIM, PubMed. Introduction to the VectorNTI Suite of software. Navigating other genome database sites (Ensembl, Celera). Refseq, LocusLink, Unigene. 2-D Gel Electrophoresis. Gene expression, genetic engineering, applications to transgenic plants and animals. Knockout genes. Introduction to a comprehensive sequence analysis suite (Lasergene). Protein structure analysis: alpha and beta structure, hydrophathy, membrane topology, antigenicity, post-translational modifications, targeting signals.

#### **Fourth Year First Semester**

**ICT-401      *Telecommunication Engineering*      *Credit: 3.00***

**Telephone:** Telephone apparatus; ASTIC; Transmission bridge; Concept of telephone exchange; Local exchange; TAX, ITX; Strowger & EMD switch; Digital time switch; Digital space switch; TST & STS switch; Video Telephony; Modem & codec; Intercom & PABX; Telephone traffic.

**Telegraph:** Introduction to facsimile system; Scanning; Recording; Facsimile transmission & reception; Submarine cable telegraphy; E-mail.

**Television:** Color TV Transmission, Color TV Camera, Transmission System (PAL, N.T, S.C, and SECAM). Color TV receivers-introduction to basic CTV receiver with the aid of Block diagram, tuner and IF amplifiers.

**ICT-403      *Artificial Intelligence*      *Credit: 3.00***

**Introduction:** Definition of AI, Historical Development of AI, Applications of AI, AI Techniques. Logic: Propositional Logic, First-Order Logic, Resolution Principle. Problem Representation: State-Space Representation, Problem-Reduction Representation. Production Systems: PS Structure, Recognition-Action Cycle, Inference Directions, Blackboard Systems, PS Implementation. Frame Representation: Basic structure, Inheriting of Properties, Slot Extension Implementation Relational Data Model: Relational Database Model, Entity and Relationship, Generalization and Aggregation. Search: Blind and Non-Blind Searches, Depth-First Search, Breadth-First Search, Heuristic Search, Best-First Search, Optimal Search, A Search, Implementation Complexity.

**Fuzzy Knowledge:** Probability Theory, Dempster-Shafer Theory, Fuzzy Set Theory Expert Systems, Natural Language Processing: Syntactic Semantics and Pragmatics, Top-Down Parsing, Bottom-Up Parsing, Lexicon. Programming Languages for AI Research: Historical Overview, Features of AI Programming Languages, Major AI Programming Languages LISP, PROLOG)

**ICT-404      *Network Design Lab*      *Credit: 1.00***

**ICT-500      Network Security      Credit: 3.00**

**Network security:** Introduction; Cryptology and simple cryptosystems; Conventional encryption techniques; Stream and block ciphers; DES; More on Block Ciphers; The Advanced Encryption Standard; Confidentiality & Message authentication: Hash functions; Number theory and algorithm complexity; Public key Encryption; RSA and Discrete Logarithms; Public key encryption (continued): Elliptic curves; Digital signatures; Key management schemes; Identification schemes; Dial-up security; E-mail security, PGP, S-MIME; Kerberos and directory authentication; Emerging Internet security standards; SET; SSL and IPsec; VPNs; Firewalls; Viruses; Miscellaneous topics;

**ICT-500      Research Project      Credit: 2.00**

Students will complete a research work with proper documentation as assigned by teacher.

**Option IV (Select any one):**

**ICT- 407      E-Commerce and Web Programming      Credit: 3.00**

**Introduction and Concepts:** Networks and commercial transactions – Internet and other novelties; networks and electronic transactions today, Model for commercial transactions; Internet environment – internet advantage, worlds wide web and other internet sales venues; Online commerce solutions.

**Security Technologies:** Insecurity Internet; A brief introduction to Cryptography; Public key solution; Key distribution and certification; prominent cryptographic applications.

**Electronic Payment Methods:** Updating traditional transactions; Secure online transaction models; Online commercial environments; digital currencies and payment systems; Offline secure processing; private data networks.

**Protocols for Public Transport of Private Information:** Security protocols; secure protocols; Secure hypertext transfer protocols; Secure sockets layers; Integrating security protocols into the web; Non technical provide.

**Electronic Commerce Providers:** On-line Commerce options: Company profiles.

**Electronic Payment Systems:** Digital payment systems; First virtual internet payment system; cyber cash model.

**On line Commerce Environments:** Servers and commercial environments; Netscape product line; Netscape commerce server; Microsoft internet explorer and servers; open market.

**Digital Currencies:** Operational process of Digicash, Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange; Its basics; EDI versus Internet and EDI over Internet.

**Strategies, Techniques and Tools:** Internet strategies; Internet Techniques, Shopping techniques and online selling techniques; Internet tools.

Electronic Commerce Online Resources and Guide to the CD-Rom.

**ICT-408      E-Commerce and Web Programming Lab      Credit: 1.00**

Laboratory works based on ICT-407

Multimedia system- introduction; Coding and compression standards; Architecture issues in multimedia; Operating system issues in multimedia- real – time OS issues, synchronization, interrupt handling; Database issues in multimedia- indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia – Quality- of-service guarantees, resource reservation, traffic specification, happening, and monitoring , admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia- digital watermarking, partial encryption schemes for video on demand, voice over IP.

**ICT-410      *Multimedia Lab*      *Credit: 1.00***

Laboratory works based on ICT-409

**Option V (Select any one)**

**ICT-411      *Simulation and Modeling*      *Credit: 3.00***

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, Time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discrete-continuous models; Monte Carlo simulation; Simulation of queuing systems.

Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random varieties; Output analysis.

Simulation languages; Analysis and modeling of some practical systems.

**ICT-413      *E-Governance*      *Credit: 3.00***

**Course related Updated topics**

**Fourth Year Second Semester**

**ICT-415      *Digital Signal Processing*      *Credit: 3.00***

Sampling of signals in time and frequency domain; Convolution, Correlation, Hilbert Transform, Discrete Fourier Transform , Fast Fourier Transform; Bilinear Transformation; Stability, FR and IIR filters; Structure of digital filters ;Windows, Effect of finite word length in digital filters; algorithms for optimization and design of digital filters.

**ICT- 416      *Digital Signal Processing lab*      *Credit: 1.00***

Laboratory works based on ICT-415

**ICT- 417      *Communication Engineering- II*      *Credit: 3.00***

**Cellular telephony:** Basic cell concept; Cell pattern & frequency reuse scheme; Cell site; B.S.C, M.S.C; handoff; FDMA; TDMA & CDMA; GSM technology, ad-hoc communication,

**Satellite Communication:** Kepler's law; Launching sequence & Positioning of a satellite in orbit, Station keeping; satellite stabilization; Ground base station; Satellite link design; VSAT, GPS.

**ICT-419      *Optical Communication*      *Credit: 3.00***

**Introduction:** Measurement of Information, Channel Capacity, Communication System Architecture, Basic Optical Communication System, Advantage of Optical Communication.

**Propagation in Dielectric Wave-guides:** Introduction, Step-index Fibers, Modes and Rays, Slab Wave Guide.

**Attenuation in Optical Fibers:** Introduction, Absorption, Scattering, Very Low Loss Materials, All Plastic and Polymer-Clad-Silica Fibers.

**Wave Propagation:** Wave Propagation in step-Index Fiber, Overall Fiber Dispersion-Single Mode Fibers, Multimode Fibers, Dispersion-Shifted Fiber, Dispersion, Flattened Fiber, Polarization.

**Source and Detectors:** Design of LED's for Optical Communication, Semiconductor Lasers for Optical Fiber Communication System, Semiconductor Photodiode Detectors, Avalanche Photodiode Detector and Photo multiplier Tubes.

**Optical Fiber Communication System:** Telecommunication, Local Distribution Series, Computer Networks Local Data Transmission and telemetry, Digital Optical Fiber Communication System-First Generation System, Second Generation System, Future System.

**Data Communication Networks:** Network Topologies, Mac Protocols, Analog System.

**Advanced Multiplexing Strategies:** Optical TDM, Sub carrier Multiplexing, Optical Transport Network, Optical Access Network, Optical premise Network.

**ICT-420      *Optical Communication Lab*      *Credit: 1.00***

Laboratory works based on ICT-419

**ICT-500      *Research Project*      *Credit: 2.00***

Students will complete a research work with proper documentation as assigned by teacher

***Option VI (Select any one):***

**ICT-421      *Cyber Law*      *Credit: 3.00***

**Basic Concepts of Technology and Law:** Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence.

**Law of Digital Contracts:** The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography,

**Intellectual Property Issues in Cyber Space:** Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World,

**Rights of Netizens and E-Governance:** Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws. Information Technology Act, International Scenario in Cyber Laws, Cyber Law Issues for Management, Security Perspective, Internet Security Issues, Digital Signatures for Securing Information Assets, Security Policies.

**ICT-423**      ***Client- Server Technology***

***Credit: 3.00***

**Course related Updated topics**

**ICT-425**      ***Distributed and Parallel Processing***

***Credit: 3.00***

Parallel Computing architectures: Overview of the major classes of architectures and their evolution. Parallel programming models and performance analysis: Modeling, Performance analysis, efficiency, and benchmarking. Programming parallel computers: Overview of parallel programming, parallel languages, parallelizing compilers, message passing and data parallel Programming models. Message passing programming and MPI: Uses, historical background and use on MIMD machines; current implementations; programming using the Message Passing Interface (MPI). Data parallel programming and HPF: Data parallel programming paradigm; historical background and use of SIMD machines; array syntax; Fortran 90 and High Performance FORTRAN (HPF). Shared memory programming, threads and Open MP: Use of shared memory machines; threads; mutual exclusion; locks, semaphores and monitors; parallel Java; programming using Open MP. Case Study: Monte Carlo Simulation of the Ising Model- Case study from computational physics; different approaches to parallelism; regular vs irregular problems; techniques and tricks for parallel implementation in MPI, HPF, Open MP and threads. Distributed computing: Distributed and concurrent computing on loosely coupled distributed systems; motivation and applications; transparency and met computing; networks and clusters of workstations; cluster systems. Distributed computing middleware: Middleware, RPC; DCE; CORBA; Java RMI Middleware, DCE CORBA Java RMI. Grid computing: The Grid; Grid computing (met computing over wide-area networks): grid computing environments (Globes Legion, DISC World...); Internet computing Grid computing: Internet computing.

# MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY

Department  
of  
Information and communication Technology (ICT)

## Syllabus:

Session: 2004-2005

Degree: B.Sc (Engg.) in ICT

*Total Credit: 148*

*(1 Credit = 14 Hours)*

Santosh, Tangail