



Mawlana Bhashani Science and Technology University

Syllabus for:

Session: 2012-2013 and Onwards

Degree: B.Sc (Engg.) in ICT

**Department of Information and Communication
Technology (ICT)**

B.Sc. (Engg.) in Information and Communication Technology (ICT):

The Department of Information and Communication Technology (ICT) offers a 4-year program of Bachelor of Science (Engg.) in Information and Communication Technology (ICT). To become a graduate in this field one has to complete 160 credit hours.

The program is designed to satisfy the growing demand for IT professionals throughout the country. It gives students the opportunity to obtain a broad-based knowledge of Computer Science, Communication Engineering and Information Technology. Moreover there are sufficient number of Mathematics, Electrical Engineering, Communication Engineering, Basic Sciences, Commerce and Arts Courses.

Program Duration:

MBSTU introduces two semesters (each semester of six months) in one academic year. Therefore, the whole program can be completed in 8 semesters (i.e. 4 years).

Course Structure:

Course Type	No. of Courses	Credit Hours
Core Courses:		
A. ICT Courses		
I. IT Theory	20	55
II. IT Lab work	15	15
III. CT Theory	14	40
IV. CT Lab work	11	11
V. Research Project	02	04
B. Mathematics Courses (MATH)	05	15
C. Physics Courses (PHY)	01	03
D. Chemistry (CHEM)	01	02
E. Statistics		
I. Theory	01	02
II. Lab work	01	01
F. Business (Financial and Managerial Accounting)	01	03
Arts and Humanities Courses (HUM)	04	09
Total:	76	160

Semester wise Credit Hour:

S/N	Year	Semester	No. of Course		Credit Hour		Total
			Theory	Lab	Theory	Lab	
1.	First	First	6	4	15	4	19
2.	First	Second	8	3	18	3	21
3.	Second	First	6	4	17	4	21
4.	Second	Second	7	3	18	3	21
5.	Third	First	6	3	17	3	20
6.	Third	Second	5	5	15	5	20
7.	Fourth	First	5	5	15	6	21
8.	Fourth	Second	4	4	12	5	17
Total:			47	31	127	33	160

* Including Research Project.

Mawlana Bhashani Science and Technology University

Santosh, Tangail

Department of Information and communication Technology

Proposed Syllabus for the B.Sc.(Engg.) in ICT

Session 2010-2011

Total Credit: 160.00 (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 – 1101	Basic Electrical Circuit	3.00	00.00	3.00
ICT – 1102	Basic Electrical Circuit Lab	00.00	1.00	1.00
ICT – 1103	Computer Programming-I	3.00	00.00	3.00
ICT – 1104	Computer Programming-I Lab	00.00	1.00	1.00
ICT – 1105	Introduction to Information Technology	3.00	00.00	3.00
ICT – 1106	Introduction to Information Technology Lab	00.00	1.00	1.00
ICT – 1107	Mathematics-I	3.00	00.00	3.00
ICT – 1109	English	2.00	00.00	2.00
ICT – 1110	Engineering Drawing	00.00	1.00	1.00
	Option-I (Select any one course)	2.00	00.00	2.00
Total		15.00	4.00	19.00

Optional-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>	
ICT – 1111	Technology, Environment and Society	2.00	00.00	2.00
ICT – 1113	Sociology	2.00	00.00	2.00

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-1201	Electronics-I	3.00	00.00	3.00
ICT-1202	Electronics-I Lab	00.00	1.00	1.00
ICT-1203	Computer Programming-II	2.00	00.00	2.00
ICT-1204	Computer Programming-II Lab	00.00	1.00	1.00
ICT-1205	Discrete Mathematics	3.00	00.00	3.00
ICT-1207	Mathematics-II	3.00	0.00	3.00
ICT-1209	Data Structure	3.00	00.00	3.00
ICT-1210	Data Structure Lab	00.00	1.00	1.00
ICT-1211	Physics	2.00	00.00	3.00
ICT-1213	Chemistry	2.00	00.00	2.00
	Option-II			0.00
Total		18.00	3.00	21.00

Option-II (Select Any One Non-Credit Course)

<i>Course Code</i>	<i>Course Title</i>	<i>Class hours/week</i>		<i>Credit</i>
		<i>Theory</i>	<i>Lab</i>	
ICT-1215	Bhashani Studies	2.00	00.00	00.00
ICT-1217	Philosophy	2.00	00.00	00.00
ICT-1219	Bangladesh Studies	2.00	00.00	00.00

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-2101	Electronics-II	3.00	00.00	3.00
ICT-2102	Electronics-II Lab	0.00	1.00	1.00
ICT-2103	Programming with Java	2.00	00.00	2.00
ICT-2104	Programming with Java Lab	00.00	1.00	1.00
ICT-2105	Algorithm Design and Analysis	3.00	00.00	3.00
ICT-2106	Algorithm Design and Analysis Lab	00.00	1.00	1.00
ICT-2107	Digital Logic Design	3.00	00.00	3.00
ICT-2108	Digital Logic Design Lab	00.00	1.00	1.00
ICT-2109	Differential Equation and Vector Calculus	3.00	0.00	3.00
ICT-2111	Financial and Managerial Accounting	3.00	00.00	3.00
Total		17.00	4.00	21.00

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-2201	Electromagnetic Fields and Waves	2.00	00.00	2.00
ICT-2203	Advanced Java	3.00	00.00	3.00
ICT-2204	Advanced Java Lab	00.00	1.00	1.00
ICT-2205	Relational Database Management Systems	3.00	00.00	3.00
ICT-2206	Relational Database Management Systems Lab	00.00	1.00	1.00
ICT-2207	Computer Organization and Architecture	3.00	00.00	3.00
ICT-2209	Complex Variables and Fourier Analysis	3.00	0.00	3.00
ICT-2211	Statistics	2.00	0.00	2.00
ICT-2212	Statistics Lab	0.00	1.00	1.00
ICT-2213	Economics	2.00	00.00	2.00
Total		18.00	3.00	21.00

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 – 3101	Analog Communication	3.00	00.00	3.00
ICT – 3102	Analog Communication Lab	00.00	1.00	1.00
ICT – 3103	Data Communication	3.00	00.00	3.00
ICT – 3105	Microprocessor and Assembly Language	3.00	00.00	3.00
ICT – 3106	Microprocessor and Assembly Language Lab	0.00	1.00	1.00
ICT – 3107	Distributed Database Management System	2.00	00.00	2.00
ICT – 3108	Distributed Database Management System Lab	0.00	1.00	1.00
ICT – 3109	System Analysis and Design	3.00	00.00	3.00
ICT – 3111	Numerical Methods	3.00	00.00	3.00
Total		17.00	3.00	20.00

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 – 3201	Microwave Engineering	3.00	00.00	3.00
ICT – 3202	Microwave Engineering Lab	00.00	1.00	1.00
ICT – 3203	Peripheral Interfacing and Embedded System	3.00	00.00	3.00
ICT – 3204	Peripheral Interfacing and Embedded System Lab	00.00	1.00	1.00
ICT – 3205	Computer Network	3.00	00.00	3.00
ICT – 3206	Network Planning and Designing Lab	00.00	1.00	1.00
ICT – 3207	Signals and Systems	3.00	00.00	3.00
ICT – 3208	Signals and Systems Lab	00.00	1.00	1.00
ICT – 3209	Operating System	3.00	00.00	3.00
ICT – 3210	Operating System Lab	00.00	1.00	1.00
Total		15.00	5.00	20.00

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 – 4101	Software Engineering	3.00	00.00	3.00
ICT – 4102	Software Engineering Lab	00.00	1.00	1.00
ICT – 4103	Artificial Intelligence	3.00	00.00	3.00
ICT – 4104	Artificial Intelligence Lab	00.00	1.00	1.00
ICT – 4105	Digital Signal Processing	3.00	00.00	3.00
ICT – 4106	Digital Signal Processing Lab	00.00	1.00	1.00
ICT – 4107	Network Security and Cyber Law	3.00	00.00	3.00
ICT – 4000	Research Thesis/Project	0.00	2.00	2.00
	Optional-III	3.00	00.00	3.00
	Optional-III Lab	0.00	1.00	1.00
Total		15.00	6.00	21.00

Optional-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 – 4109	Internet and Web Programming	3.00	00.00	3.00
ICT – 4110	Internet and Web Programming Lab	0.00	1.00	1.00
ICT – 4111	VLSI Design	3.00	00.00	3.00
ICT – 4112	VLSI Design Lab	0.00	1.00	1.00
ICT – 4113	Bio-Informatics	3.00	00.00	3.00
ICT – 4114	Bio-Informatics Lab	0.00	1.00	1.00
ICT – 4115	Computer Graphic	3.00	00.00	3.00
ICT – 4116	Computer Graphic Lab	0.00	1.00	1.00

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 – 4201	Wireless and Mobile Communication	3.00	00.00	3.00
ICT – 4202	Wireless and Mobile Communication Lab	00.00	1.00	1.00
ICT – 4203	Optical Communication	3.00	00.00	3.00
ICT – 4204	Optical Communication Lab	00.00	1.00	1.00
ICT – 4205	Simulation and Modeling	3.00	00.00	3.00
ICT – 4000	Research Thesis/Project	00.00	2.00	2.00
	Optional-IV	3.00	00.00	3.00
	Optional-IV Lab	00.00	1.00	1.00
Total		12.00	5.00	17.00

Optional-IV (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 – 4207	Digital Image Processing	3.00	00.00	3.00
ICT – 4208	Digital Image Processing Lab	0.00	1.00	1.00
ICT – 4209	Geographical Information System	3.00	00.00	3.00
ICT – 4210	Geographical Information System Lab	0.00	1.00	1.00
ICT – 4211	E-commerce System Infrastructure and Implementation	3.00	00.00	3.00
ICT – 4212	E-commerce System Infrastructure and Implementation Lab	0.00	1.00	1.00
ICT – 4213	Distributed and Parallel Computing	3.00	00.00	3.00
ICT – 4214	Distributed and Parallel Computing Lab	0.00	1.00	1.00

FIRST YEAR FIRST SEMESTER

ICT – 1101	Basic Electrical Circuit	3.00	00.00	3.00
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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, Nortons 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.

Coupled circuit: Analysis of inductively coupled and magnetically coupled circuits.

Recommended Books:

1. Robert L. Boylested, “Introductory Circuit Analysis”.
2. Tony R. Kuphaldt, “Lesson’s in Electrical Circuit”
3. W. Nilson& S.A. Riedel, “Electrical Circuits”.
4. Nilson, “ Introductory Circuitry for Electrical and Computer Engineering”.
5. Alexander, principles of electrical circuits.

ICT – 1102	Basic Electrical Circuit Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-1101.

ICT – 1103	Computer Programming-I	3.00	00.00	3.00
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Introduction: Definition of Software, its classification, Problem solving steps, Introduction of C and its structure, history and Characteristics, Introduction to keywords, constants and identifiers, Fundamental of C variable and data types, Rules of constants, Introduction to arithmetic, relational and logical operators, Introduction to expressions, Managing data input, Managing data output.

Control statements: Decision making and branching. *If* and *if... else* statements, Other control statements, *switch* and the ‘?:’ operator, Decision making and looping. *While* looping, *Do...while* and *for* looping statements, Jump statements *goto*, *break* and *continue*.

Array: Introduction to arrays. One-dimensional array. Some sample programs, Two-dimensional array. Some sample programs, String handling in C and some examples.

String: Introduction to character Arrays and String, Declaring and Initializing String variables, Reading Strings from Terminal, Writing String to Screen, Putting String Together, Comparison of Two Strings, String Handling Functions, Table of Strings.

Function: Need for multifunction programs, Definition of Function, return values, types and some examples, Function Calls, Function Declaration, Calling functions and arguments, Nesting of Function, Recursions, passing arrays to functions, Passing string to function, The Scope, Visibility and Lifetime of Variables, Storage class.

Function: Need for multifunction programs, return values, types and some examples, Calling functions and arguments, Recursions, passing arrays to functions, Storage class.

Structure: Definition of Structure, Union, Structure union applications, Declaring Structure Variables, Accessing Structures Members, Arrays within Structure, Self-referential Structure, Array of structure and some examples.

Pointer: Understanding pointers, Pointers and arrays, Pointers and functions, pointers and structures, Some special features of C (Macros, Enumerations), Bitwise operations.

Recommended Books:

1. Byron S. Gottfried : Theory and Problems of Programming with C.
2. Herbert Schildt : Teach Yourself C.
3. Deitel H. M. and Deitel P J, C++: How to Program.
4. Robert Lafore : The Waite Group’s C Programming using Turbo C++.
5. Yashavant Kanetkar, : Let Us C.
6. Herbert Schildt: : Turbo C/C++: The Complete Reference.
7. E. Balagurusamy : Programming in ANSI C.
8. C Kernighan & D.M. Ritchie : The C programming Language.

ICT-1204	Computer Programming Lab-II	00.00	1.00	1.00
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Laboratory based on the course ICT-1103.

ICT – 1105	Introduction to Information Technology	2.00	00.00	2.00
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Introduction of computer and its Organization: Historical evolution of computers & classification, Computer generations, Basic organization and functional units of computer, Input/output/storage/arithmetic logic/control and central processing unit (CPU), Internal structure of CPU.

Number Systems, Computer Codes and Arithmetic: Non-positional/positional number system, different number systems & their conversion, Fractional numbers, Numeric/alphanumeric data, BCD/EBCDIC/ASCII code, Binary arithmetic (Addition, subtraction, multiplication and division).

Computer Memory & I/O devices: Memory location and address, RAM, ROM, PROM, and EPROM, cache memory, Sequential/Direct/Random access device, Magnetic tape and disk, hard disk, floppy disk, CDRom, optical disk, Printers, Keyboard, Mouse, Scanner, and other devices.

Computer program, software and language: Program planning, algorithms, flow charts, pseudo code, Software and firmware, types of computer software, types of computer language, translator, interpreter, compiler.

Operating System and Data processing: Evolution of OS, Multiprogramming, Multiprocessing, Time sharing system, Real time system, types of data processing, database concept, database management system, SQL, Data mining.

Data Communication and Computer Network: Basic elements of a communication system, Types of communications among computers, characteristics of communication channels, Computer Networks, LAN, MAN, WAN, network security, Network topologies.

Others: Management Information system, office Automation, Multimedia concepts and components, WWW, WAP, E-commerce, E-governance, Internet, Internet services.

Recommended Books:

1. Peter Norton, McGraw-Hill, Introduction to computers.
2. Dr. M. LutfarRahaman : Computer Fundamentals
3. P. K. Sinha: Computer Fundamentals Concepts, Systems and Applications
4. N. Subramanian: Introduction to Computers
5. V. Rajarcman : Fundamentals of Computers
6. Peter Norton: Introduction to Computer

ICT – 1106	Introduction to Information Technology Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-1106

ICT – 1107	Mathematics-I	3.00	00.00	3.00
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Differential Calculus:

Limits, continuity and differentiability; Successive differentiation of various types of functions; Leibniz’s Theorem; Rolle’s Theorem; Mean value Theorem in finite and infinite forms; Lagrange’s form of remainders; Cauchy’s form of remainder; Expansion of functions; Evaluation of indeterminate forms by L’Hospital’s rule; Partial differentiation; Euler’s Theorem; Tangent and Normal, Subtangent and subnormal in cartesian and polar co-ordinates; Maximum and minimum values of functions of single variable; Points of inflexion; Curvature, radius of curvature, center of curvature; Asymptotes, curve tracing.

Integral Calculus:

Definitions of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Walli's formula, 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; Trapezoidal rule, Simpson's rule. Arc lengths of curves in cartesian and polar co-ordinates, parametric and pedal equations; Intrinsic equation; Volume of solids of revolution; Volume of hollow solids of revolution by shell method. Area of surface of revolution; Jacobian, multiple integrals and their application.

Recommended Books:

1. B.C. Das & B. N. Mukherjee :Differential and Integral Calculas
2. Howard Anton and Stephen Devis : Calculas A New Horizon
3. K.A. Stroud :EngineeringMathmatics
4. M. R. Spiegel : Advanced Calculas
- 5 .Earl W. Swokowski:Calculus with Analytic Geometry
6. Erwin Kreyszig : Advanced Engineering Mathematics
7. P. K Bhattacharjee :Integral Calculus

ICT – 1109	English	2.00	00.00	2.00
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English phonetics: The place and manners of articulation of the English sounds, Vocabulary.

English grammar: construction of sentence, some grammatical problems; preposition, phrasal verbs, idioms, derivatives, Comprehension; Paragraph writing, Prices writing, Amplification, Report writing, Business communication and tenders, Short stories written by some well known classic writers.

Recommended Books:

1. Wishon, G.E and Burks, J.M. : Let's Write English
2. Wren & Martin : High School English Grammar and Composition
3. Murphy : Intermediate English
4. Maurice Imhoof and Herman Hudson: From Paragraph to Essay
5. Jupp and Milne : Guided Course in English Composition
6. Houghton Mifflin English : Grammar and Composition
7. Longhead, Lin : Business Correspondence

ICT – 1110	Engineering Drawing	00.00	1.00	1.00
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Identification of drawing instruments and their uses; Measuring scales and units; Paper sizes; Lettering; Free hand sketching; Alphabet of lines; Geometrical construction of tangents, ellipse, involutes & spiral; Dimensioning; Isometric, Orthographic and Oblique Projection; Sectioning; Conventional representation of some common features & abbreviation; Deployment of surfaces and cams; Computer aided engineering; Some modern engineering design software's and their applications.

ICT – 1111	Technology, Environment and Society	2.00	00.00	2.00
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Definition of terminology – technology, environment and society; Interdependence of technology , environment and society; Growth of technologies and its contribution to human development; Technology and competitiveness; Technical change and worker’s skills – effect of innovation on labor and employment’s – the human element;

Current state of technology and its future use as an instrument of change in twenty first century; Environment, Concept of environment, concept of environmental impact, impact of technology and human upon the environment, impact of the environment upon human, change in the global climate; Water – its use and abuse; waste water, air pollution – past, present and future;

Solid waste –types, collection, disposal, potential uses for solid wastes; System for resource and energy recovery – renewable energy – scientific principle, technical implications and social implications Radiation hazards – radioactivity in human environments, disposal of under wastes.

Society factors leading to the growth of a society, rights of a citizen; Urban growth and decay; human impact on wildlife; Maintaining human habitat on earth; Population control- policies and prospects.

ICT – 1113	Sociology	2.00	00.00	2.00
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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. Ethics of Bhashani. Bureaucracy as a organ of modern state, Marxism, Power Authority, Pressure Group.Government, Effect of sociology on society.

Recommended Books:

1. P.B. Horton, C.L. Hunt : “Sociology”.
2. R.T. Schaefer : “Sociology”.
3. B.B. Hess, E.W.Markson : “Sociology”

FIRST YEAR SECOND SEMESTER

ICT-1201	Electronics-I	3.00	00.00	3.00
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Theory of semiconductor: Energy band diagram of conductor, insulator and semiconductor, intrinsic and extrinsic semiconductor, effects of temperature on extrinsic semiconductors, Drift, Diffusion and other carrier theory.

Semiconductors diodes: Theory of p-n junction as diode, Junction diode characteristics and applications, Zener diodes and its application, Schottky Barrier Diodes, Varactor Diodes, Photo Diodes, Tunnel diodes, PIN diode, LCD,Half wave and full wave rectification with filtering and voltage regulators and power supply design.

Bipolar Junction Transistor (BJT): PNP and NPN transistors, principles of operation, biasing and thermal stability, characteristics in different configurations, small signal analysis, BJT amplifiers, π -

model, T-model, transistor switching time, equivalent circuits using transconductance parameter for low, medium and high frequency operation of BJT.

Field Effect Transistor (FET): Construction of JFET and MOSFET, characteristics and principles of operation, FET biasing, small signal analysis, introduction to CMOS and its application. Application of FETs as amplifier and switches, load line analysis, equivalent circuits using transconductance parameter for low, medium and high frequency operation of FETs, Ebers-Moll model view; design and analysis of single/multistage amplifiers, power amplifiers, differential amplifiers.

Industrial Semiconductor Device: Structure and basic operation of LED, SCR, UJT, DIAC, TRIAC, photo diodes, phototransistor, solar cells, Concept on vacuum devices.

Recommended Books:

1. Sedra& Smith, "Microelectronic Circuits".
2. Millman&Halkias , "Electronic Devices & Circuits"
3. Bapat K N, "Electronic Devices & Circuits"
4. Ramanan," Functional Electronics"
5. Millman&Taub, "Pulse Digital and Switching Waveforms"
6. Allan Mottorshed, " Electronic Devices & Circuits"
7. Millman&Halkias , "Integrated Electronics"
8. Boylestead&Neshelsky , "Electronic Devices & Circuit Theory"
9. Schilling &Belove "Electronic Circuits ,Discrete & Integrated" TMH
- V. K Metha, "Priciples of Electronics".

ICT-1202	Electronics-I Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-1201.

ICT-1203	Computer Programming-II	2.00	00.00	2.00
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File management: File management concept in C, Defining, opening and closing a file, Input/output operations in file, Error handling and command line arguments, Introduction to graphics, Drawing some geometric objects.

Dynamic Memory Allocation: Dynamic Memory Allocation, Allocating a Block of Memory: MALLOC, Allocating a Multiple Blocks of Memory: CALLOC, Releasing the used Space: Free, Concept of Linked Lists, Types of Linked Lists, Creating a Linked Lists, Inserting and Deleting an Item from Linked Lists, Applications of Linked Lists.

Searching and Sorting: Searching And Sorting Item From Array, Linked List, Binary Search, Liner Search, Types Of Sorting, Bubble Sort, Selection Sort, Merge Sort In Arrays

Recommended Books:

1. Byron S. Gottfried : Theory and Problems of Programmin with C.
2. Herbert Schild : Teach Yourself C.

3. Deitel H. M. and Deitel P J, C++: How to Program.
4. Robert Lafore : The Waite Group's C Programming using Turbo C++.
5. Yashavant Kanetkar, : Let Us C.
6. Herbert Schildt: : Turbo C/C++: The Complement Reference.
7. E. Balagurusamy : Programming in ANSI C.

ICT-1204	Computer Programming II Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-1203.

ICT-1205	Discrete Mathematics	3.00	00.00	3.00
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Introduction: Set theory-Set operation, Representation of Sets, Algebraic Properties of set, computer representation of set, Logic-Propositional Calculus, Logic and bit operation, Predicate and quantifier, Translating sentence into logical expressions

Function: Introduction of function, some important function, Properties of function, Sequence and summation, Relation- Representation of Relation, Properties of Relation, Some important Relations, Closures of relation.

Number Theory: Fundamental Theorem of Arithmetic, Modular Arithmetic; GCD, LCM, Prime Number, Congruence, Application of Congruence, Linear Congruence, Application of Number Theory, Mathematical Induction, Methods of Proof, First and Second principle of Mathematical induction.

Counting Principle: Basic Counting principle, Inclusion-Exclusion principle, Application of Sum rule and Product rule, Pigeon hole principle, Permutation Combination, Binomial Theorem.

Definition of Graph: Types of graphs, Representation of graph, Euler and Hamilton path, circuit, necessary and sufficient conditions.

Graph coloring: Isomorphism of graph, Tree- Comparison of tree and Graph, Spanning tree, algorithm of several trees, Application of trees, Tree Traversal, Trees and sorting.

Recommended Books:

1. Kenneth H. Rosen : Discrete Mathematics and its Applications
2. Olympia Nicodemi : Discrete Mathematics.
3. Knuth : Concrete Mathematics
4. Seymour Lipschutz & Marc Laris Lipson : Theory and Problems of Discrete Math.
5. Donald F. Stanat & David F. McAllister : Discrete Mathematics in Computer Science
6. B. Kolman, R.C. Busby and S. Ross : Discrete Mathematical Structures.
7. C. L. Liu : Elements of Discrete Mathematics.

ICT-1207	Mathematics-II	3.00	0.00	3.00
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Linear Algebra: Definition of matrix; Different types of matrices; Algebra of matrices; Adjoint and inverse of a matrix; Elementary transformations of matrices; Determinants: Matrix polynomials; Cayley-Hamilton theory with uses of rank and nullity; Normal and canonical forms; Solution of linear equations; Eigenvalues and eigenvectors.

Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between a pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves, circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in Cartesian and polar co-ordinates; Co-ordinate Geometry of three dimensions: System of co-ordinates, Distance of two points, Section formula, Projections, Direction cosines, Equation's of planes and Lines.

Recommended Books:

1. Md. Abdur Rahman : Co-Ordinate Geometry
2. K.A. Stroud : Engineering Mathematics
3. Richard Bronson : Liner Algebra
4. Earl W. Swokowski : Calculus with Analytic Geometry
5. P. N. Chatterjee : Matrices
6. Thomas, Finey : Calculus and analytic geometry
7. P. K. Bhattacharjee : Co-ordinate geometry & vector analysis
8. M. L. Khanna Solid geometry:
9. JT bell Coordinate Geometry
10. K Stein Calculus and Analytic Geometry

ICT-1209	Data Structure	3.00	00.00	3.00
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Introduction: Concept of data types, abstract data types.

Array: Insertion, Deletion, Matrix representation of arrays, Multidimensional arrays, Pointers arrays, Record structures, Representation of records in memory; parallel arrays. Sparse matrices. Usefulness of sparse matrices.

Stack and Queue: Push and Pop operations. Arithmetic expression: polish notation implementation using stack Queue: Insert and Delete operations. Double ended queue, Priority queue.

Recursion: Direct and indirect recursion, Simulation of recursion, Depth of recursion, Removal of recursion. Towers of Hanoi using recursion. Linked lists: One way and two way linked lists. Traversing, Searching, Insertion and Deletion operations. Concept of algorithm analysis.

Sorting and Searching: Bubble sort, Quick sort Merge sort, Selection sort, Inserting sort, Radix sort, Shell sort, linear searching, binary searching.

Tree: Binary Trees, Binary Search Trees: Traversing (inorder, preorder, postorder). Insertion and deletion operations in Binary search trees. Threaded Binary Tree, Application of trees. Set representation, decision trees, game trees and counting binary trees. B-tree and basic operations on B-tree. Binomial tree and binomial heap, operation on binomial heaps. Fibonacci heaps and operations. Heap sort. Huffman codes and compression algorithm. Disjoint set and operations and disjoint set forests forests. Red black tree and operations. General trees.

Graphs: Graph representation, Adjacency matrix, Path matrix, Linked representation. Shortest paths: Warshall 's algorithm. Operations on graphs: Insertion of an edge or a node. Deletion of an edge or a

node. Traversing a graph: Breadth first, Depth first. Posets: Topological sorting. Spanning trees and connected component. Finding minimum cost spanning tree using Prim's algorithm. Critical paths, enumerating all paths.

Symbol tables: Static and dynamic tree tables. Hashing: Hash function and overflow handling, Open hashing (Separate chaining) Close hashing (Open addressing), Linear probing, Quadratic probing, Double hashing.

Files: File queries sequential organization. Indexing Technique: Clinder + surface indexing, Hash indexes trees, Indexing-Btrees, Tree indexing.

Recommended Books:

1. Edward M. Reinggold : Data structures
2. Robert Sedgwick : Algorithms in C
3. Horowitz E and Sahni S Galgotia : Fundamentals of Data Structures.
4. Niklauswirth : Algorithms and Data Structures.
5. Seymour Lipschetz : Data Structure
6. Y. Langsam, Augenstein, A. M. Tanenbaum : Data Structures Using C and C++

ICT-1210	Data Structure Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-1209.

ICT-1211	Physics	2.00	00.00	2.00
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Solids and Semiconductors:

Solids, Crystalline Solids, Amorphous Solids, Crystal lattice, Basis, Unit cell, Lattice Parameters, Single Crystals, Polycrystals, Crystal Systems and Bravais lattices, Energy Bands in Solids, Conductors, Insulators and Semiconductors, Charge Carriers in Semiconductors, Intrinsic and Extrinsic Semiconductors, Doping, N-type and P-type semiconductors, Electron and Hole Concentrations in Intrinsic Semiconductor in Thermal Equilibrium, Fermi Levels in N-type and P-type Extrinsic Semiconductors, Electrical Conductivity, diffusion Current.

Wave and Oscillation:

Simple harmonic motion, Combination of S.H.M. and Lissajous figures, Damped Oscillations, Forced Oscillations, Resonance.

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.

Audible, Ultrasonic, Infrasonic and Supersonic waves; Propagation and speed of longitudinal waves, Traveling longitudinal waves, Standing longitudinal waves, Beats, The Doppler effect.

Electricity & Magnetisms:

Electronics: Charge & Matter, Column'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.

Recommended Books:

1. Modern Physics : R. Murugesan and KiruthigaSivaprasath
2. Concepts of Modern Physics : A. Beiser
3. Modern Engineering Physics : A. Vasudeva
4. Solid State Physics : R. P. Singhal
5. Electricity and Magnetism : R. Murugesan
6. A Textbook of Optics : N Subrahmanyam and BrijLal
7. Optics and Spectroscopy : R. Murugesan and KiruthigaSivaprasath
8. Waves and Oscilation : BrijLal

ICT-1213	Chemistry	2.00	00.00	2.00
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Atomic Structure: Fundamental particles, Rutherford's atom model, Bohr's theory of hydrogen atom, Planck's quantum theory, emission spectrum of hydrogen, de Broglie equation, Heisenberg uncertainty principle, Schrödinger wave equation, quantum number, atomic orbitals-their shapes and orientation, Pauli's exclusion principle, Hund's rule, Aufbauprinzip.

Chemical Bonds: Ionic bonds and the properties of ionic compounds, Covalent bond: brief study of Valence Bond Theory (VBT) and Molecular Orbital Theory (MOT), Coordination bond, Metallic bond, Hydrogen bond, Van der Waals forces, elements and compounds of Si, Ge, B, Al. Structure and bonding of coordination compounds.

Spectroscopy: Quantization of energy, region of spectrum, representation of spectrum, principles, instrumentation and concise study of Infrared (IR), Raman, Microwave and Electronic (UV) spectroscopy, correlation of spectral features with structures of simple compounds.

Electrochemistry: Mechanism of electrolytic conductance, Kohlrausch's law, Ionic mobility and conductance, transport number, electrode potential, cell emf, electrochemical cell.

Biological Chemistry: A brief study of amino acids and peptides, properties of amino acids, N and C terminal amino acid residues, end group analysis, the covalent structure of protein, protein isolation and purification, amino acid sequencing of proteins, protein domain and subunit, DNA chemistry, central dogma, DNA replication, transcription and translation.

Recommended Books :

1. Introduction to modern inorganic chemistry, S.Z. Haider, Student Publication.
2. Concise inorganic chemistry, J.D. Lee, Blackwell Science, UK.
3. Basic inorganic Chemistry, Cotton, Wilkinson and Gaus, 2nd Ed., John Willey &
4. Fundamentals of molecular spectroscopy-Banwell, McGraw Hill, NY.
5. Spectroscopy of organic compound, P.S. Kalsi, New Age Internationsl (P) Ltd,
6. Essential of Physical Chemistry, B.S. Bahl, G.D. Tuli&ArunBahl, S. Chand
7. PoromanurGothonabongPorjaySaroni- KalipadaKundu, Bangla Academy.
8. RasayonicBondhonabongOnurAakrity-KalipadaKundu, Bangla Academy.
9. Biocoordination Chemistry, D.E. Fenton, Oxford Science Publication, USA.
10. Lehninger Principles of Biochemistry, D.L. Nelson, M. M. Cox, Freeman, NY.
11. Advanced Inorganic Chemistry, 6th Edition by F. Albert Cotton
12. Chemistry of the Elements, Second Edition by A. Earnshaw
13. Basic Inorganic Chemistry, 3rd Edition by F. Albert Cotton

ICT-1215	Bhashani Studies	2.00	00.00
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The Syllabus of this course is under construction

ICT-1217	Philosophy	2.00	00.00
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The Syllabus of this course is under construction

ICT-1219	Bangladesh Studies	2.00	00.00
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The Syllabus of this course is under construction

SECOND YEAR FIRST SEMESTER

ICT-2101	Electronics-II	3.00	00.00	3.00
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Operational amplifiers and applications: Linear application of op-amp, Feedback, gain, input and output impedances, Properties of an ideal Op-Amp, non-inverting and inverting amplifiers, integrator, differentiator, weighted summer and other applications of Op-Amp circuits, frequency response and bandwidth.

Oscillators circuits and wave generators: Phase shift oscillator, Wine Bridge, Crystal, Tune collector oscillators, Sinusoidal. Feedback, Comparators and Converters, Schmitt trigger.

Active Filters: Butterworth filters, Band-pass filters, Band Reject Filters, All pass Filters.

Linear wave shaping: Linear and non-linear wave shaping. Diode Wave Shaping Techniques, Clipping and Clamping circuits. Non-linear function circuits. Negative resistance switching, Voltage regulators, Pulse generation.

Timing Circuits: Bi-stable, monostable and astable multivibrators, sweep and staircase generator, IC 555 and its application. Application of Op-Amp in timing circuits. VCO, PLL, blocking oscillators, practical op-amp ICs and advanced ICs.

Recommended Books:

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| 1. Op amps and Linear Integrated circuits | : R F Coughlin |
| 2. Design with operational Amplifiers Analog Ics | : Sargio Franko |
| 3. Microelectronics | : Millman & Grabel TMH |
| 4. Op-amps and Linear integrated Circuits | : Gaykwad |
| 5. Integrated circuits | : K R Botkar |
| 6. Analog Integrated Circuits | : Gray John |
| 7. Micro Electronics | : Horstian |
| 8. Microelectronic circuit | : Sedra & Smith |
| 9. Opamps and Linear integrated Circuits | : D A Bell |

ICT-2102	Electronics-II Lab	0.00	1.00	1.00
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Laboratory based on the course ICT-2101.

ICT-2103	Programming With Java	3.00	00.00	3.00
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JAVA: Introduction to OOP, Data Types and Variables Operation and Expressions Features of Object Oriented Programming Control Structures, Decision Making, Looping, Branching Arrays, String Vectors, Java Methods, Concept of classes and objects, Encapsulation ,Inheritance, Interfaces, Abstract Class and Multiple Inheritance, Polymorphism, Interfaces and Multiple Inheritance, API, Overriding, Overloading, Packages, Generics, Collections, Thread, Multithreading, Error and Exception Handling, Graphical User Interfaces, Java Applets, Files and Streams, Java Database Connectivity (JDBC), Servlet, JSP.

Recommended Books:

1. Robert Lafore : “Object Oriented Programming in C++”
2. Herbert Schildt : “Teach yourself C++”
3. Deitel&Deitel :Java How to Program
4. E Balagurusamy : “Object-Oriented Programming with C++”
5. Irvine : “C++ Object Oriented Programming”
6. P. Naughton and H. Schildt, :*The Complete Reference Java 2*,
7. Patrick Naughton, Herbert Schildt :The Complete Reference, Java-2
8. E. Balagurusamy :Programming with Java
9. SAMS publications :Teach Yourself Java-2 in 21 days
10. A primer, E Balagurusamy : Programming with Java.
11. Deitel&Deitel. :How to Program Java
12. NaughtonSchildt, :The Complete Reference Java 2

ICT-2104	Programming With Java Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-2103.

ICT-2105	Algorithm Design and Analysis	3.00	00.00	3.00
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Algorithm and Data structure: Algorithm, Properties of good algorithm, Data Structure, Application Areas of Algorithm. Complexity Analysis of Algorithms, Asymptotic Notations, Recurrences, Insertion Sort and its Complexity Analysis

Divide and Conquer approach & Heaps: Divide and Conquer approach and Merge Sort, Algorithm of Merge Sort, Complexity Analysis Merge Sort, Quick Sort and its Algorithm, Complexity Analysis of Quick Sort, Heap Construction Algorithm, Heap sort, Application of Heap: Priority Queue.

Dynamic Programming: Algorithm of LCS, Dynamic Programming, Matrix Chain Multiplication Example, Algorithm of MCM, and Example of Longest Common Subsequence, Complexity Analysis

Greedy Algorithm: Greedy Algorithm, Activity Selection Problem, Huffman Codes and its application, Knapsack problem, *NP*-Hard and *NP*-Complete Problems, Traveling Salesperson Problem, Complexity Analysis

Graphs basic & traversal techniques: Representation of Graphs, Breadth First Search, Depth First Search, Algorithm of BFS and DFS, Minimum Spanning Tree, Kruskal and Prim's Algorithm, Complexity Analysis.

Shortest Path & Backtracking: Single Source Shortest Paths, Dijkstra's Algorithm, and Bellman-Ford Algorithm. All pair Shortest Path, Floyd Warshall Algorithm, Backtracking, *n*-Queen Problem, and Complexity Analysis, Branch and Bounds.

Computational Geometry & Number Theory: Computational Geometry, Line Segment Properties, Convex Hull, Graham Scan Algorithm of Convex Hull, Number Theory, GCD, Modular Arithmetic, Prime Number generation, Complexity Analysis.

Recommended Books:

1. Cormen :Introduction to Algorithms
2. Horowitz, Shanny :Computer Algorithms
3. D. E. Knuth :The art of Computer Programming
4. M. Allen :Data Structure and Algorithm analysis in C++.

ICT-2106	Algorithm Design and Analysis Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-2105.

ICT-2107	Digital Logic Design	3.00	00.00	3.00
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Number System: Review of Number system, Binary, Octal, Hexadecimal, BCD, ASCII.

Basic Logic Circuits: Gates; Boolean Algebra; De Morgan's Theorem; Half and Full Adders, Subtractor, Sum of products and Product of sums; Mapping technique; Karnaugh map; Minimization of Logic circuits.

Combinational Circuits: Encoders & Decoders; Comparator; Parity generator, ALU; Multiplexer, Demultiplexers.

Silicon integrated Logic Families: AND, OR, INVERTER, other logic families with TTL, DTL, RTL, RCTL, TIL, ECL, IIL, SOS, FET, & CMOS families

Sequential Circuits: S-R, M/S, JK, D and T Flip-flops and Latches, Registers and Counters; Asynchronous and Synchronous counters, Different types of Registers; Counter application: Frequency and Digital Clock.

Memory Circuit & System: Introduction to memories; SAM; ROM; Static and Dynamic RAM, Flash memories, Charge coupled device and magnetic bubble memories. A/D Converter, D/A Converter.

Recommended Books:

1. Taub & Schilling, "Digital Integrated Electronics", McGraw Hill
2. Samuel C Lee, "Digital Circuits and Logic Design", Prentice Hall
3. A P Malvino, "Digital Computer Electronics", Tata McGraw Hill

4. Morris & Miller, "Design with TTL Integrated Circuit", McGraw Hill
5. Peatman , "Digital Hardware Design", McGraw Hill
6. Ronald J Tocci , "Digital Systems, Principles and Applications ", Prentice Hall
7. Dr. V. K. Jain, "Switching Theory"
8. William I Fletcher, "An engineering approach to Digital Design", Prentice Hall
9. ZviKohavi "Switching and Finite automata Theory"TMH
10. Hayes, "Digital system Design and Microprocessors" McGraw Hill
11. John B Peatman, " Digital Hard Ware Design", McGraw Hill

ICT-2108	Digital Logic Design Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-2107.

ICT-2109	Differential Equation and Vector Calculus	3.00	0.00	3.00
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Ordinary Differential Equation (ODE): Degree and order of ordinary differential equations; Formation of differential equations; Solution of first order differential equations by various methods; Solution of first order but higher degree ordinary differential equations; Solution of general linear equations of second and higher orders with constant coefficients; Solution of homogeneous linear equations and its applications; Solution of differential equations of higher order when dependent and independent variables are absent; Solution of differential equation by the method based on factorization of operators.

Partial Differential Equations (PDE): Introduction. Linear and non-linear first order equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solution with boundary and initial conditions.

Series Solution: Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties

Vector Algebra: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products; Linear dependence and independence of vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications; Definition of line, surface and volume integrals; Gradient, divergence and curl of point functions, various formulae, Gauss's theorem, Stoke's theorem, Green's theorem.

Recommended Books:

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| 1. K.A. Stroud | :Engineering Mathematics |
| 2. F. Ayres | :Differential Equation |
| 3. K.A.Stroud | :Further Engineering Mathematics |
| 4. B. D. Havog | :Differential Equation |
| 5. M. R Spiegel | :Vector Analysis |
| 6. H. K. Das | :Advanced Engineering Mathmatics |
| 7. BhuDev Sharma | : Differential Equation |
| 8. Gupta and Sharma | : Differential Equation |
| 9. Matiur Rahman | : Applied Vector Analysis |

ICT-2111	Financial and Managerial Calculus	2.00	0.00	2.00
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Preliminaries: Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles & ethics, Accounting Equation & Transaction Analysis. Introduction to Financial Statements and automation accounting system.

Recording Business Transactions: The Accounts & their types. Double-Entry Book keeping system; Invoice, discount from purchase price, purchase return and allowances, Sale of inventory, sales discount, sales returns and allowances; Journals, ledger & Trial balance. Correcting errors in the trial balance.

The Adjusting & Closing Procedure: The adjusting process, Accrual versus cash basis Accounting, Preparation of Adjusted trial balance and financial statements, Closing entries & Reversing entries. Using accounting information in decision-making.

Accounting in practice: Worksheet. Purchase book, sales book, cashbook, petty cashbook, etc. Control accounts and subsidiary accounts. Bank reconciliation statement.

Cost In General: Cost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.

Marginal & Relevant costing: Marginal costing tools and techniques, cost-volume-profit analysis. Guidelines for decision making.

Budget: Capital budgeting; Planning, evaluation & control of capital expenditures.

Recommended Books:

1. Charles T. Horngren & Walter T. Harrison :Accounting.
 2. Adolph Matz & Milton F. Usry :Cost Accounting Planning & Control.
 3. Sankar Prasad Basu & Monilal Das. :Practice in Accountancy.
 4. Jerry J. Weygandt, Donald E. Kieso :Accounting Principles.
 5. Jay M Smith & K Fred Skousen. :Intermediate Accounting.
 6. Charles T. Horngren & Walter T. Harrison. :Accounting
- Adolph Matz & Milton F. Usry. :Cost Accounting

SECOND YEAR SECOND SEMESTER

ICT-2201	Electromagnetic Fields and Waves	2.00	00.00	2.00
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Introduction: Overview of vector analysis, orthogonal co-ordinate systems- rectangular, cylindrical, spherical transformations, Divergence, gradient, curl, Stokes theorem,

Static Electric Field : Coulomb's law, scalar potential, electric field, electric flux, Gauss's law for electric flux, capacitance of sphere, coaxial cable and two wire transmission line, electric dipole, polarization, boundary relations, divergence of the flux density, Laplace equation, uniqueness theorem, Poisson's equation .

Static Magnetic Field: Magnetic flux, Biot-Savart law, Ampere's law, Gauss's law for magnetic flux, boundary conditions, inductance of a coaxial cable, two wire transmission lines, Magnetic vector potential

Time varying Electric and Magnetic Fields:- Faraday's law, Stokes's theorem, eddy current, displacement current. Maxwell's Equations integral & differential form, General solution of wave equation in free space - uniform plane waves - TEM waves –relation between electric and magnetic fields, Plane waves in a lossy medium, Skin depth, solutions of wave equations. Poynting theorem – real and complex Poynting vector, application of pointing theorem - power flow in transmission lines, uniform plane waves.

Transmission lines: Analogy between circuit theory & EM theory. Uniform transmission line – Voltage and Current solution - characteristic impedance. Terminated uniform transmission line VSWR –impedence matching quarter wave and half wave length transformer, stub matching -single stub matching, double stub matching and tuning - pulses on a transmission line- smith chart –Impedance matching using Smith Chart, Transmission line transformers.

Recommended Books:

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| 1. Fundamental of Engineering Electromagnetics | :D. K. Cheng |
| 2. Electromagnetic waves and fields, | :Jordan and Balmain |
| 3. Engineering Electromagnetic | :W. H. Hayt |
| 4. Introduction to Electromagnetic Field and Waves | : Nasar and Paul |
| 5. Microwave Devices & Circuits | : Samuel Y Liao |
| 6. Fields and Waves in Communication Electronics | :S.Ramo, J.R. Whinnery |
| 7. Elements of Engineering Electromagnetics, | :N. RAO, Prentice Hall. |
| 8. Electromagnetics, | :JOHN D. KRAUS. |
| 9. Foundations for Microwave Engineering, | :R.E.COLLIN |
| 10. Microwave Engineering. | : D.M. POZAR. |
| 11. Electromagnetics | : J. D. Kraus |
| 12. Electromagnetism | :Parmanik |
| 13. Fundamentals Electromagnetism | :Guru Thomson |
| 14. Introduction to Electromagnetic Engineering | :K. P. Harrington |
| 15. Elements of Electromagnetics | :Saddique |

ICT-2203	Advanced Java	3.00	00.00	3.00
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Java Database Connectivity: JDBC Product, Types of Driver, Two tier Client/Server Model, Three tier Client/Server Model, Basic steps of JDBC, Creating and Executing SQL statement, The Result Set Object, Working with Database Meta Data ,Interface

Servlets: Servlet Interaction & Advance Servlet, Life Cycle of Servlets, Java Servlet Development Kit, Javax.servlet package, Reading Servlet parameter, Reading Initialization parameter, The Javax.servlet.http Package, Handling http

JavaServer pages: JSP Technologies, Understanding the Client Server Model, Understanding the Web Server Software, Configuring the JSP Server, Handling JSP Errors , JSP translation time Errors, JSP Request Time Errors, Creating a JSP Error Page

Remote Method Invokation: RMI Architecture, Designing RMI Application, Executing RMI Application.

EJB: Types of Enterprise Java Beans, Session Bean & Entity Bean, Features of Session Bean, Life Cycle of Stateful Session Bean, Feature of Entity Bean, Container Managed Transaction, Bean Managed Transactions, Implementing a Container Managed Entity Bean, Cookies, Filtering.

XML: What is XML, XML Syntax Rules, XML Parsing

Struts: Introduction to Apache Struts, MVC Architecture, Struts Architecture, How Struts Works, Introduction to Struts Controller, Introduction to Struts Action Class, Using Struts Action Form Class, Using Struts HTML Tags, Introduction to Struts validation framework, Client Side Address validation in Struts, Custom Validation Example, Developing Application with Struts tiles

Basic features of Hibernate and Spring Framework

Recommended Books:

1. P. Naughton and H. Schildt, : *The Complete Reference Java 2*,
2. Patrick Naughton, Herbert Schildt : *The Complete Reference, Java-2*
3. E. Balagurusamy : *Programming with Java*
4. SAMS publications : *Teach Yourself Java-2 in 21 days*
5. A primer, E Balagurusamy : *Programming with Java.*
6. Deitel&Deitel. : *How to Program Java*
7. NaughtonSchildt, : *The Complete Reference Java 2*

ICT-2204	Advanced Java Lab	2.00	00.00	2.00
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Laboratory based on the course ICT-2203.

ICT-2205	Relational Database Management Systems	3.00	00.00	3.00
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Introduction: Database, data, database management system, Database system versus file system, Data model, Database language, Database user administration, Database system structure, Storage manager, Overview of Physical storage medium.

Entity-Relationship Model: Entity sets, Relationship sets, Mapping Cardinalities, Keys, Attributes, Entity relationship diagram, Weak entity sets, Specialization, Generalization, Structure of Relational databases, Database Schema.

The Relational Algebra and SQL: Selection, projection, Union, Set difference, Cartesian-product, Rename, Set-intersection, Natural-join, Division, Assignment, projection, Aggregate functions, Deletion, Insertion, Updating, Views, Nested sub-queries, Set membership, Set comparison.

Integrity and Security and Relational Database Design: Domain constraint, Integrity, Assertions, Triggers, Authorization, Authentication, Security, Privileges, Roles, Audit trails, Encryption-Decryption Algorithm, Normalization, Decomposition, Functional Dependencies, Closure of a set of Functional dependencies.

Database Design and E-R model: The Entity Relationship Model, Constraints, Entity Relationship Diagram, Entity Relationship Design Issues, Weak Entity Set, Extended E-R Features.

Storage and File Structure: Physical Storage Media, Magnetic Disk, RAID, Storage Access, File Organization, Organization of Record in Files, Data Dictionary Storage

Recommended Books:

1. H. F. Korth : “Database System Concept”
2. Ivan Bayross : SQL,PL/SQL
3. Litwin,Paul :Access 2000 Developers Handbook.
4. Oracle : “SQL Star International Limited”
5. BOU : “Database Management Systems”
6. Ramez E. Marsi : “Fundamentals of Database Systems”
7. Jeffry : “Fundamentals of Database”
8. Kock and Loney : “Oracle 8i the Complete Reference”
9. Kelvin Loney : “Oracle DBA Handbook”

ICT-2206	Relational Database Management Systems Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-2205.

ICT-2207	Computer Organization and Architecture	3.00	00.00	3.00
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Computer abstraction and technology: Introduction, Below Your Program, Under the Covers, Integrated Circuits: Fueling, Innovation. The roll of performance: Introduction, Measuring Performance, Relating the Metrics, Choosing Programs to, Evaluate Performance, Comparing and Summarizing Performance.

Language of the Machine: Introduction, Operations of the Computer Hardware, Operands of the Computer Hardware, Representing Instructions in the Computer, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Beyond Numbers, Other Styles of MIPS Addressing.

Arithmetic of Computers: Introduction, Signed and Unsigned Numbers, Addition and Subtraction, Logical Operations, Constructing an Arithmetic Logic Unit, Multiplication, Division, Floating Point. The Processor: Data path and Control: Introduction, Building a Data path, A Simple Implementation Scheme, A Multicycle Implementation, Microprogramming: Simplifying Control Design.

Enhancing performance with pipelining: An Overview of Pipelining, A Pipelined Data path, Pipelined Control, Data Hazards and Forwarding, Data Hazards and Stalls, Branch Hazards. Multiprocessors: Introduction, Programming Multiprocessors, Multiprocessors Connected by a Single Bus, and Multiprocessors Connected by a Network, Clusters, and Network Topologies.

Memory Organization: Introduction, Characteristics of memory systems, Main memory design, Memory hierarchy, Cache memory, Virtual memory and memory management concepts.

Recommended Books:

1. J. P. Hayes :Computer Architecture and Organization
2. Dr. M. Rafiquzzaman :Fundamentals of Computer System Architecture
3. Romesh S. Gaonkar :Microprocessor, Architecture, Programming & Application with 8085
4. John Hennesy, David Patterson: Computer Organization and Design
5. ShafwatZaky : Computer Architecture

ICT-2209	Complex Variables and Fourier Analysis	3.00	0.00	3.00
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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; Mapping by elementary functions; Line integral of a complex function; Cauchy’s Integral Theorem; Cauchy’s Integral Formula; Liouville’s Theorem; Taylor’s Theorem and Laurent’s Theorem. Singular points; Residue; Cauchy’s Residue Theorem. Evaluation of residues; Contour integration; Conformal mapping.

Fourier Analysis: Fourier series, Convergence of Fourier Series, Fourier analysis; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave equations.

Laplace Transforms: Definition; Laplace transforms of some elementary functions; Sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms; Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.

Recommended Books:

1. Glyn James :Advanced Modern Engineering Mathematics
2. Michael D. Greenberg :Advanced Engineering Mathematics
3. K.A.Stroud :Further Engineering Mathematics
4. H. K Das :Advanced Eng. Mathematics
5. M. R Spigel :Advanced Calculus
6. M. R. Spigel : Complex Variable
7. Schaum Out Line Series :Lap laces Transformation
8. Rajput : Engineering Mathematics
9. M. L. Khanna : Complex Variable
10. Schaum’s Outlines Series : Laplace Transform
11. Abdur Rahman : Mathematical Method (Vol-I &Vol-II)

ICT-2211	Statistics	2.00	00.00	2.00
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Preliminaries: Definition of Statistics, Its necessity & importance, Population and Sample, Variable and Constants, Different types of variables, Statistical data, Data Collection and presentation, Construction of Frequency distribution, Graphical presentation of Frequency distribution.

Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean, and Theorems & Problems.

Measures of Dispersion: Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance, Moments, Skewness and Kurtosis, Theorems & Problems.

Correlation Theory: Linear Correlation Its measures and significance, Rank Correlation, Theorems & Problems.

Regression Analysis: Linear and non-linear regression, Least-square method of curve fittings, Theorems & Problems.

Probability: Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bay's theorem, Random Variables, Mathematical Expectation and Variance of a random variable, Theorems & Problems.

Probability Distributions: Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems.

Recommended Books:

1. S.C. Gupta and V.K. Kapoor :Fundamentals of Mathematical Statistics
2. Alberto Leon Garcia :Probability & Random Process for Electrical Engg.
3. R.N. Shill & S.C. Debnath :An introduction to the theory of Statistics
4. M.G. Mostafa :Methods of Statistics
5. Murry R. Spiegel :Theory and problems of Statistics
6. J.N. Kapoor & H.C. Saxena :Mathematical Statistics
7. DrManindra Kumar Roy :An Introduction to the theory of Probability
8. S.P. Gupta :Advanced Practical Statistics.
9. M.K. Roy :Fundamentals of Probability and probability Distribution

ICT-2212	Statistics Lab	0.00	1.00	1.00
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Laboratory based on the course ICT-2211.

ICT – 2213	Economics	2.00	00.00	2.00
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Introduction: Definition of economics, Scope and utility of studying economics.

Micro-economics: The theory of demand and supply and their elasticity, Price determination, Nature of an economic theory, applicability of economic theories to the problems of developing countries. Indifference curves technique, Marginal utility analysis,

Production: Production function, types of productivity, The nature of Isoquants and Isocosts, Rational region of production of an engineering firm. Euler's theorem.

Market: Concepts of market and market structure. Cost analysis and cost function. Small scale production and large-scale production, Optimization, Theory of distribution.

Macroeconomics: Savings, investment, employment, National income analysis, Inflation, Monetary policy, Fiscal policy and trade policy with reference to Bangladesh.

Economics of development: Dimensions of development, Relevance of theory, the employment problem, Human resource development

Economics of planning: Planning and market, Policy models, Planning experience

Recommended Books:

1. Richard Leftwich- :The Price System and Resource Allocation
2. P.A. Samuelson- :Economics
3. P.A. Samuelson & Nordhaus :Economics
4. G.J. Stigler- : The Theory of Price.

THIRD YEAR FIRST SEMESTER

ICT – 3101	Analog Communication	3.00	00.00	3.00
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Introduction to analog communication: Necessity and Types of modulation, transmitters, transmission channels and receivers.

Spectral Analysis: Preview of Fourier transform theory, energy, power, Parseval's theorem, Power Spectral Density Functions (PSDF), Analog Spectrum Analyzers, Auto Correlation Function, Relationship between the PSDF and the Auto Correlation Function, PSDF's of harmonic signals and un-correlated (white) signals. Review of signal transfer in linear systems, ideal Lowpass Filters.

Continuous Wave linear Modulators: Amplitude modulation (AM), Time Domain Expression and Modulation Index, Frequency Domain (Spectral) representations, and Transmission bandwidth for AM. AM for a single Tone Message, Phasor Diagram of an AM signal, Illustration of the Carrier and Side Band Components.

Double Side Band (DSB) Modulation: Time and Frequency Domain Expressions, Square Law Modulators, Balanced Modulators, Ring Modulators, Single Side Band Modulation (SSB), Generation of SSB using a Side Band filter, Indirect Generation of SSB, Vestigial Side band Modulation (VSB).

Demodulation for Linear Modulation: Demodulation of AM signals, Square Laws and Envelop Detectors, Super heterodyne Receiver for Standard AM Radio, Synchronous demodulation of AM, DSB and SSB.

Frequency and Phase modulation: Instantaneous Frequency and phase, Time Domain Representations for FM and PM, Phasor Diagram for FM and PM. FM and PM Signals for a Single Tone Message, Modulation Index and Phasor Diagrams. Spectral representation of FM and PM for single tone message. Transmission bandwidth for FM, Carson's rule, Narrow band and Wide Band FM and PM signals. Generation of FM, Commercial FM requirements. Demodulation of FM and PM signals, Limiter, discriminator, Commercial and Stereo FM Radio.

Frequency division multiplexing (FDM) Systems: FDM in Telephony, Telephone Hierarchy and examples of Group and Super group Generation. Filters and Oscillator requirement in FDM.

Representation of Random Signals and Noise in Communication System: Signal Power and Spectral Representations, White noise, Thermal noise, PSDF of White Signals. Input and Output Relationship for Random Signals and Noise Passed Through a Linear Time Invariant System, Band Limited White Noise, ARC Filtering of White Noise.

Noise performance of Analog Communication Systems: Signal-to-Noise Ratio in Linear Modulation, Synchronous Detection of DSB. Signal-to-Noise Ratio for AM and SSB, FM, Effect of Noise in Envelope and Square Law Detection of AM, Threshold Effects in Nonlinear Detectors

Recommended Books:

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|----------------------------------|---|
| 1. George Kennedy, | :Electronic communication systems |
| 2. Taub and Schilling, | :Principles of communication systems |
| 3. Martin S Roden | :Analog and Digital Communication systems |
| 4. Sol Lapatine , | :Electronic communication |
| 5. Dennis Roody and John Coolen, | :Electronic communication |
| 6. J Dunlop & D G Smith | :Telecommunication Engg. |
| 7. Simon Haykin John | : Communication Systems |

8. Proakis & Salehi : Communication Systems Engineering
 9. B P Lathi :Analog & Digital Communication
 10. B P Lathi :Communication Systems

ICT – 3102	Analog Communication Lab	0.00	1.00	1.00
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Laboratory based on the course ICT-3101.

ICT – 3103	Data Communication	3.00	00.00	3.00
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Data Communication fundamentals and Network Model: Trend of data communication, Data communication's components, Network criteria, Protocols and Standards, Standards Organizations, Basic concepts of line configuration, Topology, Transmission modes and Categories of Networks, Introduction to network standards and protocols, Layered approach of communication study, OSI model and function of its seven layers, TCP/IP protocol suite and addressing.

Signal and system, Transmission media, interfaces: Analog signal, digital signals, periodic signal, Time and Frequency domain, Composite Signals, Decomposition of digital signal, bandwidth, throughput, transmission impairment: attenuation, distortion and noise. Nyquist bit rate, Shannon capacity and performance analysis, Electromagnetic wave, Electromagnetic spectrum, Guided media: twisted pair cable, coaxial and fiber optic cable. Unguided media: radio wave, microwave and Infrared. Standard connectors, NIC, HUB, bridge, router, gateway and modems, antenna.

Digital Transmission: Digital to digital conversion, Line encoding schemes, block coding, scrambling, Analog to digital conversion, PAM, PCM, and DM, Transmission modes: parallel, serial, synchronous, and asynchronous.

Analog Transmission: Digital to analog conversion: ASK, FSK, PSK, QAM, MSK, GMSK etc., Bandwidth utilization, Analog to digital conversion: AM, FM and PM.

Multiplexing, Spreading and switching: Multiplexing – FDM, WDM, TDM (Synchronous and statistical) spread spectrum FHSS & DSSS, packet-switched data networks, circuit switched data networks, Virtual Circuit networks.

Error-Recovery and Link-Control: Data link layer and control, Error detection and correction, framing, flow and error control, Stop-and-Wait protocol, Automatic Repeat Request (ARQ), Go-Back-N, Selective Repeat, HDLC, PPP.

Multiple Access: Wired LAN, Wireless LAN, Connecting LAN, Backbone networks and virtual LAN.

Wireless WANS and Optical Networks: Cellular Telephone, Sattelite Networks, SONET/SDH.

Recommended Books

1. Behrouz A Forouzan: Data Communications and Networking. (4th Edition)
2. Willium Stallings: Data and computer communication, Seventh edition.
3. Andrew S Tanenbaum:
Computer Networks
4. F. Halsall : Data
communication Computer Network and open systems

ICT – 3105	Microprocessor and Assembly Language	3.00	00.00	3.00
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Introductory Concept: Evaluation of microprocessor, Types of microprocessor, system bus, hardware of a microprocessor, memory-addressing technique.

8086 Microprocessor: properties, architecture, registers, FLAGS register, physical address calculation, addressing modes, Instruction set, Instruction format, Fetch-decode-Execution cycle, interrupt, Types of interrupt, handling interrupt request, interrupt vector and table.

Advanced Microprocessors: Intel 80286 architecture, 80286-memory management, Protection; Intel 80386 functional diagram; 386 programming model; 80386 modes; Multi programming, 80486 and Pentium microprocessor.

I/O operation: Isolated and memory mapped I/O, DMA technique, I/O ports, I/O processor.

Assembly Language: Hardware of Microprocessor, Registers, assembler, Assembly language syntax, variables, Directives, Basic Instructions and their formats, The FLAG register, JMP, LOOP, CMP instructions, Conditional jump instruction, programming with high level structure.

Logic instructions, Shift instructions, Rotate instruction, the stack and stack related instructions, Procedure and procedure related instructions, Multiplication and Division instructions-MUL, IMUL, DIV, IDIV, CBW, CWD, arrays, addressing modes, and XLAT instructions. String instructions, Macro definition, Parameters in Macro, Macro directives, Nested macros, Interrupt, Interrupt vector and routine, Bios Interrupt, Dos Interrupt, The IN, OUT, INS and OUTS instructions.

Recommended Books:

1. Ytha Yu; Charles Marut : Assembly Language Program & Organization of the IBM PC
2. V. Hall : Microprocessors and Interfacing.
3. Kip r. Irvine : Assembly Language for the IBM-PC.
4. Peter Abel : IBM PC Assembly Language and Programming;
5. Mohamed Rafiquzzaman : Microprocessor and Microcomputer Based System Design.
6. T. Hanley : Microprocessor and microcomputer
7. John F. wakerly : Micro Computer architecture and programming
8. John P. Hayes : Compute architecture and organization
9. Bary B Brey : The INTEL Microprocessors 8086/8088

ICT – 3106	Microprocessor and Assembly Language Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3105.

ICT – 3107	Distributed Database Management System	2.00	00.00	2.00
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Transaction: ACID Properties, Transaction state diagram, Implementation of Atomicity and Durability, Shadow copy technique, Concurrent Execution, Serializability, Recoverability,

Recoverable schedule, Cascade-less Schedules, Implementation in Isolation, Testing of Serializability.

Concurrency control, Recovery System and Distribute databases: Lock-Based Protocols, Granting of locks, Two-phase locking protocol, Graph based protocol, Tree protocol, Timestamp based protocols, Deadlock detection and recovery. Failure classification, Storage types, Checkpoints. Distributed data, Replication and Fragmentation.

Indexing and Hashing: Basic Concepts, Ordered Indices, B⁺ Tree Index Files, B-Tree Index Files, Multiply- Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices.

Integrity and Security and Relational Database Design: Domain constraint, Integrity, Assertions, Triggers, Authorization, Authentication, Security, Privileges, Roles, Audit trails, Encryption-Decryption Algorithm, Normalization, Decomposition, Functional Dependencies, Closure of a set of Functional dependencies.

Database System Architecture: Centralized and Client-server Architecture, Server System Architecture, Parallel Systems, Distributed Systems, Network Types.

Parallel Databases: Introduction I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Interoperation Parallelism, Design of Parallel Systems

Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Concurrency Control in Distributed Databases, Distributed Query Processing, Heterogeneous Distributed Databases.

Recommended Books:

1. H. F. Korth : “Database System Concept”
2. Ivan Bayross : SQL,PL/SQL
3. Litwin,Paul :Access 2000 Developers Handbook.
4. Oracle : “SQL Star International Limited”
5. BOU : “Database Management Systems”
6. Ramez E. Marsi : “Fundamentals of Database Systems”
7. Jeffry : “Fundamentals of Database”
8. Kock and Loney : “Oracle 8i the Complete Reference”
9. Kelvin Loney : “Oracle DBA Handbook”

ICT – 3108	Distributed Database Management System Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3107

ICT – 3109	System Analysis and Design	3.00	00.00	3.00
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Concepts of system and its environment: Information, Types of information, Quality of information, System, Types of systems, Components of system, Source of information.

Information gathering: strategy, Information searching methods, Interviewing technique, System development methodologies and life cycle.

Feasibility study & Cost/Benefit analysis: Feasibility considerations, steps in feasibility analysis, feasibility report, Cost and Benefit categories, procedure for cost and benefit determination, classification of cost and benefit, cost and benefit evaluation methods.

Tools of analysis and design: Data Flow Diagram (DFD), DFD symbols, Constructing DFD; Data Dictionary; Decision Tree, Structured English, Decision Tables.

System Design and Construction: The process of design, System design phases, Design methodologies; Structured design; Form-Driven methodology; Input design, Output design, File and database design

Testing and Quality Assurance: Testing, Types of system tests; White-Box testing; Black-box testing; Quality factors specifications.

Implementation and Maintenance: Types of implementation, Documenting the system, Training and supporting users, Factor models of implementation success; The process of maintaining information system, Types of maintenance, Cost of maintenance, Reducing maintenance cost.

Hardware/ Software selection, control and security: Phases in selection, Criteria for software selection, Hardware selection, Financial considerations in selection; Security definitions, Threats to system security, Control measures, system failures and recovery.

Recommended Books:

1. System Analysis and Design: Alan Dennis, Barbara Haley Wixom
2. System Analysis and design: Elias M. Awad
3. System Analysis and Design Methods: Jeffrey L. Whitten, Lonnie D. Bentley
4. Modern System Analysis and Design: Jeffrey A. Hoffer, Joey F. George and Joseph S. Valacich

ICT – 3111	Numerical Methods	3.00	00.00	3.00
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Introduction: Significant figure, Rounding off numbers, Error in Numerical Calculation. Solution of Algebraic and Transcendental Equation, Interpolation with equal and unequal intervals- Missing values, Newton's binomial expansion formula, Newton's forward and backward interpolation formula. Central difference interpolation formulae, inverse interpolation.

Numerical Differentiation: Derivates using Newton's forward backward and Stirling's formula.

Numerical Integration: General quadrature formula for equidistant ordinates. Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rules, Weddle's rule.

Numerical solution of ordinary differential equations: Taylor's series method, Euler's method, Adams Bashforth Moulton method, Runge-Kutta method.

Solution of linear equations: Gauss-elimination method, Iteration methods. Gauss-Seidel method, Gauss-Jordan method.

Curve Fitting: objective of fitting a curve, fitting a straight line, fitting a parabola

Recommended Books:

1. G. Shanker Rao : Numerical Analysis, New Age International (P) Limited.
2. Mathus : Numerical Methods
3. Steven C Chapra : Numerical methods for Engineer.
4. Webb Miller : The Engineering of Numerical Software.

THIRD YEAR SECOND SEMESTER

ICT – 3201	Microwave Engineering	2.00	00.00	2.00
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Microstrips: Structures and characteristics.

Rectangular Resonant Cavities: Energy storage, losses. impedance transformer, filters, isolator.

Microwave Devices: Semiconductor Microwave devices, Transit time effect velocity Modulation, Microwave amplifier and oscillator; Klystron (Multicavity and reflex), Magnetron, TWT, other microwave tubes.

Antennas: Small current element, radiation resistance, radiation pattern and properties, Hertzian and half wave dipoles, Mono pole, horn, rhombic and parabolic reflector, array, and Yagi- Uda antenna.

Radar and Electronic Navigation Systems: Radar principles; Civil, military and weather applications, Radar equation, Transmitters and radiators, Factor influencing maximum range; Moving target indicator(MTI), Tracking Radar system and search systems; Electronic navigation systems, LORAN, ILS, SONAR

Modern Trends in Microwaves Engineering: Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference / Electromagnetic Compatibility (EMI / EMC), Monolithic Microwave IC fabrication, RFMEMS for microwave components, Microwave Imaging.

Recommended Books:

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| 1. Microwave Devices & Circuits | : Samuel Y Liao |
| 2. Field and Wave Electromagnetics, | :D.K.CHENG |
| 3. Elements of Engineering Electromagnetics, | :N. RAO |
| 4. Electromagnetics, | :JOHN D. KRAUS |
| 5. Foundations for Microwave Engineering, | :R.E.COLLIN |
| 6. Microwave Engineering. | :D.M. POZAR |
| 7. Antennas - | :J D Krauss MGH |
| 8. Antennas for all applications - | :J D Krauss TMH |

ICT – 3202	Microwave Engineering Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3201.

ICT – 3203	Peripherals, Interfacing and Embedded System	3.00	00.00	3.00
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Input devices: Keyboard; Key switching mechanism and coding techniques; Static encoder; Lockout and rollover; Scanning encoder; Keyboard without key.

Modern data-entry devices: Scanners overview; Bar code reader; Optical mark reader (OMR); Optical Character Reader (OCR); Digitizer: Reading technique, Capacitive Electrostatic scanning digitizer.

Display devices: CRT; Basic CRT operations; Timing and frequencies; CRT controller ICs; LCDs; LCD technologies; Passive and active matrix; Guest-host techniques; Twisted-pneumatic LCDs; LCD reliability; Electroluminescent display.

Printers: Impact printers; Dot matrix printer, niddle principal; Laser printing; Ink-Jet printing; Color printing; Plotters.

Storage devices: Floppy disk; Floppy disk controller; Position control with stepping actuators; Magnetic hard disk and controller; Compact disk.

Introductory Concept of Interfacing: I/O interface, memory interface, interfacing components and their characteristics.

Serial and parallel Interface: Characteristics of memory and I/O interface, Synchronous and asynchronous communication, Serial I/O interface, RS232, 8251A communication interface, RS-232 interface, 8155A Programmable peripheral Interface, Parallel adapter, parallel port.

Interfacing components: 8284A Programmable timer, Bus architecture, Bus Timing, Bus Controller, analog and digital interface, Interrupt sources, types of interrupt, 8259A priority interrupt controller, Daisy chain.

I/O Controller: 8237A DMA Controller, Floppy and Hard disk Controller.

Embedded System: Introduction to Embedded system, The Embedded Design Life Cycle, Models of Computation, State Charts, General language Characteristics (SDL, Petri nets, Message Sequence Charts, UML, JAVA, HDL), Embedded System Hardware,(Input, Communication, Processing Unit, Memories, output) Embedded operating systems, middleware & Scheduling, Implementing, ASIC, Embedded Systems Hardware/Software co-design.

Recommended Books:

1. Yu Cheng Liu, Glenn A. Gibson: Microcomputer System: The 8086/8088 Family.
2. Klilkinm, Computer Peripherals.
3. Douglas V. Hall: Microprocessor and Interface.
4. Mohamed Rafiquzzaman:Microprocessor and Microcomputer Based System Design.
5. Artwick : Microprocessor and Interfacing
6. Ramesh Gaonker : Microprocessor Interfacing,
7. Peter Marwedel, Embedded System Design, Kluwer.
8. Wayne Wolf, Computers as Components: Principles of Embedded Computing Systems Design, Morgan-Kaufmann.

ICT – 3204	Peripherals, Interfacing and Embedded System Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3203.

ICT – 3205	Computer Network	3.00	00.00	3.00
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Introduction: Uses of computer networks; Network Hardware; Network Software; Reference Models, Transmission & switching; Network protocols; Fiber optic network, Satellite networks, Packet radio networks.

The Physical Layer and Media: Guided transmission media, wireless transmission, radio waves, microwaves, infrared, Bluetooth; satellites communication etc.

The Network layer: Network layer design issues: IP addressing, IP packet forwarding, Sub-netting, CIDR, Internet Protocol, ICMP, ARP, RARP, DHCP, and IPv6 overview, Address mapping, Error reporting and multicasting; Delivery, Forwarding, and Routing algorithms, Congestion control algorithms

The Transport layer: The transport service, Elements of transport protocols, simple transport protocols, User datagram protocol (UDP) – UDP operations and UDP package modules, Transmission control protocol (TCP) – TCP features, TCP Connection establishment and termination, TCP Flow control and error control, Congestion control.

The Application layer: The Domain Name System, Electronic Mail, Network Management: SNMP, World Wide Web, HTTP, Multimedia etc.

Network Security: Cryptography, Symmetric-key Algorithm, Digital signature, Communication Security, Web security etc.

Recommended Books:

1. Andrew S. Tanenbaum, :Computer Networks
2. SharamHekmat, :Communication Networks.
3. Behrouz A. Fourouzan, :Data Communications and Networking,
4. Stallings :Data and Communication
5. S. Keshav, :An Engineering Approach to Computer Networking
6. William A Shay, :Understanding communication and networks
7. Leon-Garcia and I. Widjaja, :Communication Networks
8. Bertsekas and Gallagar, :Data Networks
9. Douglas Comer & D. L. Stevens :Internetworking with TCP/IP
10. Richard Stevens :TCP/IP Utilities - Vol. I, The protocols
11. SidnieFeit, :TCP/IP, Architecture, Protocols and implementation
12. Miller, :Data & Network Communications, Vikas Thomson

ICT – 3206	Network Planning and Designing Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3205.

ICT – 3207	Signals and Systems	3.00	00.00	3.00
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1. An introduction to signals and systems: Signals and systems as seen in everyday life, and in various branches of engineering and science electrical, mechanical, hydraulic, thermal, biomedical signals and systems as examples. Extracting the common essence and requirements of signal and system analysis from these examples.

2. Formalizing signals: energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals.

3. Formalizing systems: system properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

4. Continuous time and discrete time Linear shift-invariant (LSI) systems in detail: the impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

5. Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases of signals.

6. The Laplace Transform for continuous time signals and systems: the notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. Generalization of Parseval's Theorem.

7. The z-Transform for discrete time signals and systems: eigen functions, region of convergence, system functions, poles and zeros of systems and sequences, z-domain analysis. Generalization of Parseval's Theorem.

8. System realization through block-diagram representation and system interconnection. State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role.

9. The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

10. Applications of signal and system theory: modulation for communication, filtering and so on.

11. Advanced topics: time-frequency representation and the uncertainty principle, Short-time Fourier Transforms and wavelet transforms.

Textbooks/ Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. A. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons (SEA) Private Limited, c1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", Tata McGraw Hill Edition, 2003.
9. I. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2001.

ICT – 3208	Signals and Systems Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3207.

ICT – 3209	Operating System	3.00	00.00	3.00
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Principle of operating systems and Operating system structure

Definition of operating system, Different kinds of operating systems (Desktop, Multiprocessor, Distributed, Clustered, Real time, Handheld systems), Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines.

Concurrency control, Recovery System and Distribute databases: Lock-Based Protocols, Granting of locks, Two-phase locking protocol, Graph based protocol, Tree protocol, Timestamp based protocols, Deadlock detection and recovery. Failure classification, Storage types, Checkpoints. Distributed data, Replication and Fragmentation.

Multiprocessing and time sharing, Process coordination, Deadlocks

Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery From Deadlock.

Control and scheduling of large information processing systems, Resource allocation; Dispatching; Processor access methods; Job control languages

Memory management

Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Demand Paging, Page Replacement, Thrashing, Demand Paging, Page Replacement.

File systems

File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-System Implementation, Directory Implementation, Allocation Methods

Protection and security

Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Fire walling to Protect Systems and Networks.

Advanced topics: Distributed operating system, distributed file system, synchronization, real time systems, multimedia operating system

Recommended Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne. :Operating System Concepts.
2. Andrew S. Tanenbaum, : Modern Operating Systems.
3. Andrew S. Tanenbaum, : Distributed Operating Systems
4. Denis :Mastering LINUX

ICT – 3210	Operating System Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-3209.

FOURTH YEAR FIRST SEMESTER

ICT – 4101	Software Engineering	3.00	00.00	3.00
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Software Engineering Paradigms: Definition of S/W Eng.; The classical life cycle; prototyping fourth generation technique; The product and the process, measurement, matrices.

Software Project Planning: Project planning objectives; S/W slope; Resources; Metrics for S/W productivity and quality; S/W project estimation; Decomposition techniques; Empirical Estimation Models; Automated Estimation tools; S/W project scheduling.

Requirements Analysis Fundamentals: Analysis principle; Software Prototyping Specification; Requirement Analysis Methodologies; Structured and object oriented analysis; Data Flow-oriented Analysis methods.

Software Design Fundamentals: Design process; Design fundamentals: S/W architecture, program structure, Data structure, S/W procedure, Modularity, abstraction; Effective modular design; Procedural design; Data flow-oriented Design; Top-down and bottom-up design; Design Process considerations; Transform analysis; Transaction analysis; Data structure-oriented design: Logical construction of programs and systems, Data structured systems development; object-oriented design; Design concepts; Methods; strategy. Real-time Design; Coding style: Code documentation, Data declaration, statement construction, Input/output.

Software reliability and availability models: Software quality factors; software review; software quality metrics; Software reliability; Software quality assurance approach.

Software Testing Techniques: Testing fundamentals; White box testing; Basis path testing; Loop testing; Black Box testing.

Software Testing Strategies: Verification and validation; Organization for software testing; Unit testing; Integration testing; Validation testing; System testing; The art of debugging.

Software Maintenance and configuration management: Definition; Maintenance Characteristics; Maintainability; Maintenance tasks; Software configuration management.

Recommended Books:

1. Ian Sommerville :Software Engineering
2. Roger S. pressman :Software Engineering
3. Elias M. Awad :Systems Analysis and Design
4. Ian Sommerville. :Software Engineering
5. Simon Binott, Ray Farmer :Object Oriented Systems Analysis & Design using UML

ICT – 4102	Software Engineering Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4101.

ICT – 4103	Artificial Intelligence	3.00	00.00	3.00
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Concepts of Artificial Intelligence: Introduction, The Foundations of AI, The History of AI, AI technique, The State of the Art;

Problems and Problem Solving: Problems, Example of Problems, Problem Formulation, Problem-solving methods.

Various Searching Techniques: Search Strategies, Uninformed (blind) search strategies like Breadth-First search, Uniform cost search, Depth-First Search etc. and Informed or Heuristic Search Strategies like Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-End Analysis etc.

Propositional and First-Order logic: Knowledge Representation, Reasoning and Logic; Propositional Logic: Syntax, Semantics, Validity and Inference, Rules of Inference for Propositional logic; First-Order Logic: Syntax and Semantics, Using first-order logic.

Inference in first order logic: Inference Rules Involving Quantifiers, Example Proof, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution.

Game playing: Introduction, Perfect Decisions, Imperfect Decisions, Alpha-Beta Pruning;

Natural language processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.

Planning: Basic Plan-Generating Systems, Forward Production System, Representation for Plans, Backward Production System, STRIPS, Examples with problem domain;

Learning: Introduction to Learning, Inductive Learning, Learning Decision Trees, Neural Net Learning;

Probabilistic Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Fuzzy Logic;

Expert Systems: Expert system architecture, Representation and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Recommended Books:

1. Elaine Rich and Kevin Knight :*Artificial Intelligence*, 2nd Edition, Tata McGraw-Hill Publishing Company Limited.
2. Stuart Russell and Peter Norvig :*Artificial Intelligence A Modern Approach*, Pearson Education asia.
3. Nils J. Nilsson :*Principles of Artificial Intelligence*, Narosa Publishing House.
4. L. H. Tsoukalas and R. E. Uhrig :*Fuzzy and Neural Approches in Engineering*.

ICT – 4104	Artificial Intelligence Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4103.

ICT – 4105	Digital Signal Processing	3.00	00.00	3.00
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Introduction to discrete time systems, Sampling of signals in time and frequency domain; Convolution, Correlation, Hillbert Transform, Discrete Fourier Transform , Fast Fourier Transform; Bilinear Transformation; Z-Transforms, Flow graph and Matrix representation of digital network, 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.

Recommended Books:

1. Introduction to Digital Signal Processing, Tatsuo Higuchi, Shoukoudou,

2. Digital Signal Processing, Written by A.V. Oppenheim and R.W. Schafer, Translated by Hikaru Date, Koronasha
3. Digital Signal Processing -- Principles, Algorithms, and Applications, J.G. Proakis and D.G. Manolakis, Third Edition, ISBN 0-13-394338-9, Prentice Hall, 1996
4. Computer-Based Exercises for Signal Processing Using MatLab, C.S. Burrus and et al, ISBN 0-13-364845-1, Prentice Hall, 1994.

ICT – 4106	Digital Signal Processing Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4105.

ICT – 4107	Network Security and Cyber Law	3.00	00.00	3.00
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Introduction to Security: Need for security, Security approaches, Principles of security, Types of attacks.

Cryptographic Techniques : Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.

Symmetric & Assymmetric Key Cryptography : Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Assymmetric key together, Digital signature, Knapsack algorithm.

User Authentication Mechanism: Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.

Case Studies of Cryptography: Daniel of service attacks, IP spoofing attacks, Secure inter branch payment transactions.

Cyber law: digital copyrights issues, illegal duplication of software, human rights and data encryption, international cyber law, information sharing, cyber squatting .

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.

Recommended Book:

William Stallings : Cryptography and Network Security

ICT – 4000	Research Thesis/Project	00.00	2.00	2.00
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Students will perform a research project work on Information and Communication Technology. It is a continuing course, that is 2-semester-long, will be evaluated with the courses of 4th year 2nd semester.

ICT – 4109	Internet and Web Programming	2.00	00.00	2.00
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Internet Overview: Intra- and Inter-networking, Internet, Internet architecture, Internet service providers (ISP), Tier architecture of the Internet, Internet core, Access networks (DSL, cable, Wireless etc.)

Internet Applications: Voice Over IP (VoIP), Video on Demand (VoD), IPTV, and other multimedia and real time applications.

Web Programming: The web, web 2.0 and Ajax, browser basics, XHTML, cascading style sheets (CSS), JavaScript, dynamic HTML, XML, RSS, building Ajax-enabled web application, Macromedia Flash, Adobe ® Flex TM, Macromedia ®, Dreamweaver ®, web servers (IIS and Apache), database: SQL, MySQL, DBI and ADO.NET 2.0, web services, PHP, ASP.NET, web forms and web controls, JavaServer Pages web applications, Perl and CGI (Common Gateway Interface), etc.

Recommended Books:

1. Web Engineering: The Discipline of Systemetic Development of Web Applications, Wiley. Author: GertiKappel (Editor), Birgit Prýýll (Editor), Siegfried Reich (Editor).
2. Internet and World Wide Web How to Program, Prentice Hall. Author: Harvey M. Deitel, Paul J. Deitel and Andrew B. Goldberg.
3. Programming the World Wide Web, Addison Wesley. Author: Robert W. Sebesta.
4. Web Engineering: Principles and Techniques, Idea Group Publishing. Author: WoojongSuh (Editor).

ICT – 4110	Internet and Web Programming Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4109

ICT – 4111	VLSI Design	3.00	00.00	3.00
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Introduction: Introduction to MOSFETs; Enhancement and Depletion type NMOSFET, MOSFET Equivalent Circuits, GaAs MOSFETs.

MOSFET Logic Circuits: NMOS Inverter, CMOS inverter, CMOS Processing Technology, Overview of Silicon Semiconductor Technology, Basic CMOS Technology, CMOS Power Dissipation, Packaging, Scaling of MOS Transistor Dimensions Yield and Reliability. Process Enhancement, Layout Design Rules Latch up, CAD Tools for VLSI Design

MOSFET Logic Gates: NMOS, CMOS, Dynamic and Domino Logic Gates, Clocked CMOS Logic, Pass-Transistor Logic, Transmission Gates, CMOS Combinational, Sequential Logic Circuits, Bi-CMOS Logic Circuits, GaAS-MOSFET Logic Circuits, Interfacing CMOS & Bipolar Logic Families. Circuit Characterization and Performance Estimation, Resistance, Capacitance Estimation, Switching Characteristics, Delay Models, Power Dissipation, Packaging, Scaling of MOS Transistor Dimensions Yield and Reliability

CMOS Testing: Fault Models, Design Strategies.

CMOS Subsystem Design: Data-path Operations, Addition, Multiplication, Counters, Shifters, Memory Elements

Recommended Books:

1. Perry, Douglas L :HDL
2. Fabricius, :Introduction to VLSI Design
3. Charles H Roth Jr :Fundamentals of Logic Design
4. Navabi, Zainalabedin. :HDL analysis and modeling of Digital System

ICT – 4112	VLSI Design Lab	0.00	1.00	1.00
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Laboratory based on the course ICT-4111

ICT – 4113	Bio-Informatics	3.00	00.00	3.00
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Introductory Concept

Basics of Biology, Molecular Biology and Bioinformatics, The central Dogma, DNA, transcription, Translation, Genomics, Amino acids, Proteomics and Genomics, Humana Computer Interaction and Bioinformatics.

Genome Analysis and Gene Mapping

Genome analysis, genome mapping, sequence Alignment, pair wise sequence alignment, Multiple sequence alignment, local and global alignment, sequence alignment techniques: dot matrix, dynamic algorithms, Popular algorithms: Needleman and Wunsch, Smith-Waterman, Scoring methods: PAM, BLOSUM, Phylogenetic analysis. Tools for similarity search, BLAST, Phi-BLAST, Psi-BLAST, FASTA.

Classification and Analysis of Protein

Overview of protein structure, protein structure Database, Data Capture, capturing micro array data, protein structure visualization tools, protein structure alignment, protein classification approaches, Alpha and beta structure analysis, structure comparison, protein structure analysis and prediction, motif, profiles, patterns and fingerprint search, protein evolution, Methods of 2D structure prediction, 2-D Gel Electrophoresis, 2-D Gel Electrophoresis image analysis, tools: CAROL, PiKA, Z3, PDQuest.

Multiple sequence alignment, Functional annotation of sequences, Gene Identification and Prediction, Gene Expression and Microarray, Hidden Markov Model, Navigation the NCBI web site. Genbank, EMBL, OMIM, Pubmed, Navigation other genome database sites (Ensembl, Celera).

Bionic Arm

Introduction of bionic devices, working principle of bionic arm, first bionic man and woman, prospect of bionic devices, latest bionic componets.

Recommended Book:

1. Bioinformatics Methods and Applications: Genomics, Proteomics and Drug Discovery- S.C. Rastogi, N. Mendiratta, P. Rastogi; PHI
2. *Fundamental Concepts of Bioinformatics*, D.E. Krane and M.L. Raymer, Benjamin Cummings, ISBN: 0-8053-4633-3 (2003);
3. *Genetics, a Molecular Approach*, T.A.Brown, Chapman & Hall, ISBN: 0412447304;
4. *Introduction to Computational Molecular Biology*, J.Setubal and J.Meidanis, PWS Publishing Company, ISBN: 0534952623;
5. *Bioinformatics: The Machine Learning Approach*, P. Baldi and S. Brunal, MIT Press, ISBN: 0-262-02442-X;
6. *Introduction to Computational Biology: Maps, Sequences, Genomes*, M.S.Waterman, Chapman & Hall, ISBN: 0412993910;

ICT – 4114	Bio-Informatics Lab	0.00	1.00	1.00
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Laboratory based on the course ICT-4113.

ICT – 4115	Computer Graphic	3.00	00.00	3.00
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Introduction to Computer Graphics: History, Applications of computer graphics (Computer Aided Design, Animation), A survey of graphics I/O devices and types.

Graphics Software Design: survey of desired functions, toward a universal graphic language, Display files, Data bases for pictorial applications.

Graphics Techniques: Point-plotting techniques, Line drawing, Geometric Transformations, windowing and clipping, Raster graphics.

Hardware for Computer Graphics: Typical small and large system, Graphic terminals, plotters, graphic display processors, Device independent graphics systems.

Graphics Software: A simple graphic package, segmented display files, Geometric models, Picture structure.

Interactive Graphics: input techniques, Event handling, three-dimensional graphics, Curves and surfaces, 3-D transformation. Hidden surface problem: Back face removal, Hidden-Line removal, Curved surfaces.

Animations: it is based on the course teacher.

Recommended Books:

1. Introduction to Computer Graphics, Author: Foley J D
2. Multimedia: Computing, Communications & Applications, Author: Ralf Steinmetz and KlaraNahrstedt

ICT – 4116	Computer Graphic	0.00	1.00	1.00
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Laboratory based on the course ICT-4115.

FOURTH YEAR SECOND SEMESTER

ICT – 4201	Wireless and Mobile Communication	3.00	00.00	3.00
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History and Evolution of Mobile Radio Communication: Principle of Conventional Mobile Radio Systems, Limitations of Conventional Mobile Radio System.

Radio Paging: Introduction, Paging Receiver Types, On Site Paging, Transmitter Specifications, Wide Area Paging, Transmission Specifications, Paging Receivers Architecture.

Cellular Radio Systems: Basic Elements of a Cellular Radio System/Network, Principles of Operations, Frequency Spectrum and its Management, Radio Planning, Overview of Cellular Standard Systems, Digital Cellular Systems, Details of TACS and GDSM Architecture. 1G, 2G, 3G and the Forthcoming 4G Cellular Mobile Systems.

Mobile Communications by Satellite Service Systems in Operation, INMARSAT, MSAT, LEO and MEO Satellite, GMPCS Mobile Telephone and Data Sensing System using LEO and MEO Satellites (Iridium, Teledesic).

Satellite Communication. : Overview of Satellite System, **Spacecraft:** Introduction to Spacecraft Subsystem. (AOCS), Telemetry, Tracking and Command (TT&C), Spacecraft Antennas, Basic Antenna Types and Relationships Spacecraft, Antennas in Practice, Frequency Reuse, Equipment Reliability and Space Qualification, Reliability Redundancy, Multiple Access.

Earth station Technology. : Earth Station Design, Earth Station Design for Low System Noise Temperature, Large Earth Station Antennas, Satellite Television Broadcasting Networks, VSAT Technology.

Recommended Books:

1. Wireless Communication Principle and Practice By T.S. Rappaport
2. Fundamentals of Wireless Communications, David Tse, PramodViswanath
3. Wireless Communications, Andrea
4. Mobile Communication by Jochen Schiller
5. Wireless and Mobile Network Architectures By Yi bing Lin.
6. Mobile Communications Design Fundamentals By William C.Y Lee
7. GSM System Survey-ERICSSON
8. Fundamentals of Satellite Communication – K. N. Rao
9. Satellite Communications – Dr. D. C. Agarwal
10. Wireless Telecommunications Networking with ANSI 4 – Randall A Snyder & Michael.

ICT – 4202	Wireless and Mobile Communication Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4201.

ICT – 4203	Optical Communication	3.00	00.00	3.00
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Introduction: Basic Optical communication system, Advantages and application of optical fiber communication systems.

Propagation in Dielectric waveguides: Slab waveguide, Modes in symmetric and asymmetric waveguide, Coupling to the waveguide, Dispersion and distortion in the slab waveguide, integrated optic component.

Attenuation in optical fiber: Introduction, attenuation, absorption, Rayleigh scattering, Pulse distortion and information rate.

Optical fiber and fiber cables: Classification of fiber and fiber cables, step index fiber, graded index fiber, Description of modes and types of modes, Different type of modes, Numerical aperture and multipath dispersion in step-index and graded index fiber, Construction of fiber and fiber optic cable.

Light sources: LED, LD, Optical amplifiers fiber laser, vertical cavity surface-emitting laser diodes.

Light detectors: Photo detection, photomultiplier, semiconductor photodiode, PIN photo diode, Avalanche photodiode, and their comparison.

Coupler and connectors: Connector principle, fiber end preparation, splices, connectors, source coupling, loss mechanism.

Network distribution and fiber components: Direction coupler, star coupler, optical switches, wavelength converters, isolator, Attenuators, circulator, polarization, port configuration of coupler, fiber Bragg grating, Array wave guide gratings, diffraction gratings.

Noise and detection: Thermal and shot noise's, error rates, receiver circuit design, coherent optical fiber detection system, optic heterodyne receivers.

System design: analogue and digital system design, few practical problem and example, application of fiber optic communication in telecommunication.

Optical Communication: Optical Communication system with analog and digital modulation formats; performance and system budgets; Multi channel system, WDM.

Recommended Books:

1. John M. Senior : Optical Fiber Communication.
2. D. K. Mynbaev : Fiber Optic communication teach

ICT – 4204	Optical Communication Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4202.

ICT – 4205	Simulation and Modeling	3.00	00.00	3.00
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Basic Simulation Modeling: The Nature of Simulation Systems, Models, and Simulation

Discrete-Event Simulation Simulation of a Single-Server Queueing Alternative Approaches to Modeling and Coding Simulations, Parallel and Distributed Simulation ,Simulation across the Internet and Web-Based Simulation ,Steps in a Sound Simulation Study ,Other Types of Simulation : Continuous Simulation ,Combined Discrete-Continuous Simulation.

Modeling Complex Systems : Introduction, List Processing in Simulation, Approaches to Storing Lists in a Computer Linked Storage Allocation, A Simple Simulation Language: simlib. Single-Server Queueing Simulation with simlib Time-Shared Computer Model Job-Shop Model Efficient Event-List Manipulation.

Simulation Software : Comparison of Simulation Packages with Programming Languages Classification of Simulation Software General-Purpose Simulation Packages Object-Oriented Simulation, Building Valid, Credible, and Appropriately Detailed Simulation Models Experimental Design, Sensitivity Analysis, and Optimization Simulation of Manufacturing Systems.

Simulation: Partial Differential Equations, Random Signals, Hybrid Simulation, Digital Simulation; Simulation Language-GPSS, SIMSCRIPT, CSMP, etc.

Recommended Books:

1. J. Banks, J. S. Carson : Discrete Event System Simulation
2. Raj Jain : The art of Computer Systems Performance Analysis.
3. Averill M. Law, W. D. Kelton : Simulation and Modeling Analysis
4. Law Kelton :Simulation Modeling and Analysis

ICT – 4000	Research Thesis/Project	00.00	2.00	2.00
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Students will perform a research project work on Information and Communication Technology. It is a continuing course, that is 2-semester-long, will be evaluated with the courses of 4th year 2nd semester.

ICT – 4207	Digital Image Processing	3.00	00.00	3.00
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Introduction: Introduction of Digital Image Processing and Pattern Recognition, Application areas, Fundamental steps of Digital Image Processing, Components of Digital Image Processing, Image & Video, Image & Human eyes, Color TV scheme.

Analog and Digital Image: Analog and Digital Image, Image Acquisition and acquisition devices, Spatial and amplitude quantization, Pixels, Resolution, Aspect Ratio, Gray levels, Relationship color and gray levels.

Image Enhancement: Different types of Image Enhancement operations, Spatial domain and frequency domain processing, Different types of filtering.

Image Compression: Fundamental concepts of Image Compression and Data Compression, Data Redundancy, Image Compression models, Error free and Lossy compression, Image Compression Standards.

Morphological processing & Segmentation: Image Segmentation, Different types of Segmentation, Edge linking and boundary detection, Thresholding, Region oriented segmentation, Morphological Image Processing, Dilation, Erosion, Opening, Closing, Hit and Miss etc.

Image Representation: Object representation and description algorithms, Run Code, Chain Code, Signature, Skeleton, Boundary detection, Feature Extraction few case studies.

Pattern Recognition: Fundamental concepts of Pattern Recognition, Pattern, Pattern Classes, Types of Pattern Recognition, Decision Theoretic methods, Structural method, Statistical method, Neural Network, Few case studies like speech recognition, fingerprint recognition, character recognition etc.

Multimedia applications: Tele-Conferencing, Virtual Reality, Authoring Tools, Multimedia Documents, Games.

Recommended Books:

1. R. C. Gonzalez, R. E. Woods : Digital Image Processing .
2. Earl Gose : Pattern Recognition and Image Analysis.
3. Related Papers from Journals and Conferences
4. I.T. Young, J.J. Gerbrands, L.J. van Vliet :Image Processing Fundamentals
5. Russ, J.C. :The Image Processing Handbook.

ICT – 4208	Digital Image Processing Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4207.

ICT – 4209	Geographical Information System	3.00	00.00	1.00
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Basic principles and techniques used in the development of geographical information systems. It has a particularly strong focus on the application of GIS in practice and the evolution of approaches to their development and use. The main topics addressed include introduction to GIS concepts, basic hardware, software and data requirements for GIS development, evolution of GIS technology, key areas of application of GIS in practice, issues in the management of GIS, the organizational role of GOIS, and emerging trends in GIS development and usage

ICT – 4210	Geographical Information System Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4209.

ICT – 4211	E-commerce System Infrastructure and Implementation	3.00	00.00	1.00
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This course is Under construction.

ICT - 4212	E-commerce System Infrastructure and Implementation Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4211

ICT – 4213	Distributed and Parallel Computing	3.00	00.00	3.00
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Distributed System Concepts, Communication, Distributed Models, Invocation Semantics, Remote Procedure Calls, Naming, File System, Security, Concurrency control and recovery, local area network, distributed languages and communication primitives, case studies of distributed systems.

Computational demands, advantages of parallel systems. Flynn’s classification, controlled parallelism and scalability. Topologies: Mesh, binary tree, Hyper tree, Cube Connected cycles, shuffle-Connected Exchange; Uniform Memory Access (UMA & Non uniform Memory Access (NUMA) Multi processor System.

PARAM Model of Parallel Computation, PARAM Algorithms; Parallel Reductions, Prefix sum, List Ranking, Merging of Two Sorted List.

Parallel Processing: Importance, architecture, Hardware and software issues; Architectures for parallel processing - Classifications,

Comparative Study of Different Architectures: hardware issues in parallel processing, parallel programming;

Distributed Processing: Definition, Impact of distributed processing on organizations, pitfalls in distributed processing.

Distributed Applications: Abstract Syntax Notation One (ASN.1), Network Management - SNMPv2, Electronic mail - SMTP and MIME, Uniform Resource Locator (URL) and Universal Resource Identifier (URI), Hypertext Transfer Protocol (HTTP).

Mapping and Scheduling; mapping of Data from Topology to other (Ring to 2-D Mesh, Binomial trees to 2-D mesh, Rings & mesh into 2-D Mesh, Ring & Mesh into Hypercubes), Load balancing, Static scheduling on UMA multi processor systems.

Applications of parallel computing: Matrix Multiplication, Sorting (bitonic Merge sort, parallel quick sort, hyper quick sort), Searching a Graph (P-depth search, Breadth-Depth Search, Breath first search) , parallel Brach and bound algorithms

Books and References:

1. Michel J. Quinn, “ Parallel Computing: Theory and Practice,” McGraw-Hill
2. Kai Hwang, “Advanced Computer Architecture,” McGraw-Hill.
3. G. Couloris, “Distributed System, Concept & Design,” Addison Wesley 1994.
4. Tanenbaum, “Distributed Systems,” PHI
5. P. K. Sinha, “Distributed Operating Systems,” PHI.
6. A. Grama, A. Gupta, G. Karypis and V. Kumar. Introduction to Parallel Computing
7. H. El-Rewini and T.G. Lewis. Distributed and Parallel Computing, Manning
8. I. Foster. Designing and Building Parallel Programs, Addison Wesley
9. Kai Hwang and Zhiwei Xu. Scalable Parallel Computing, McGraw Hill

ICT – 4214	Distributed and Parallel Computing Lab	00.00	1.00	1.00
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Laboratory based on the course ICT-4213