# University of Rajshahi
# Department of Information and Communication Technology

# Syllabus for B.Sc. (Hons)

### Session . 2002-2003

### Examination

1st Year - 2003
2nd Year - 2004
3rd Year - 2005
4th Year - 2006

# Department of Information and Communication Technology

The B.Sc. (Honors) Courses in Information and Communication Technology shall be offered over the period of FOUR academic years and Degree must be completed not more than SIX academic years. Courses consist of Theoretical, Practical, Viva-Voce, Tutorial/ Terminal/ Class Test and Attendance are of 3200 Marks. Marks 75 and 50 represent ONE and HALF unit, respectively. One unit makes FOUR credits. The examination of one unit theoretical course shall be of three hours duration and half unit shall be of two hours. Practical examination shall be duration of (i) 6 hours (one day) for less than one unit. (ii) 6×2 hours (two days) for 1-2 unit and (iii) 6×3 hours (3 days) for more than 2 units-3 units. Marks of Tutorial/Terminal/ Class test and Attendance will be allocated as 80% for tutorial / Terminal/ Class Test and 20% for Class Attendance. Practical marks will be allocated as follows: 30% of the practical marks will be of continuous assessment and 70% marks will be from annual examination.

Year- wise distribution of Courses along with title, Unit, Marks and Credit are as follows:

## 1st Years : Examination - 2003

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| ICT-101: | Electronics | 1 | 75 | 4 |
| ICT-102: | Electromagnetic Fields, Waves and Antenna | 1 | 75 | 4 |
| ICT-103: | Pulse and Digital Electronics | 1 | 75 | 4 |
| ICT-104: | Computer Fundamentals | 0.5 | 50 | 2 |
| ICT-105: | English (Optional) | | | |
| ICT-106: | Practical-I (12 Hours) (Electrical & Electronic Circuits) | 1 | 75 | 4 |
| ICT-107: | Viva-Voce | 0.5 | 50 | 2 |
| ICT-108: | Tutorial, Terminal, Class Test and Class Percentage | 0.5 | 50 | 2 |

## Related Courses

| | | | | |
|---|---|---|---|---|
| MATH-112: | Algebra, Trigonometry & Vector Analysis | 1 | 75 | 4 |
| MATH-115: | Differential Calculus, Integral calculus | 1 | 75 | 4 |

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| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| STAT-R01 | Elementary Statistics & Probability | 1 | 75 | 4 |
| APE-R102 | Applied electricity and Magnetism | 1 | 75 | 4 |
| | **1st Year (Totals)** | **9.5** | **750** | 38 |

## 2nd Year : Examination-2004

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| ICT-201: | Analog Communication | 1 | 75 | 4 |
| ICT-202: | Electronic Circuits and Semiconductor Devices | 1 | 75 | 4 |
| ICT-203: | Computer Programming with C /C++ | 1 | 75 | 4 |
| ICT-204: | Telegraphy, Telephony and Acoustic Engineering | 0.5 | 50 | 2 |
| ICT-205: | Practical-II (18 Hours) <br> a) Electronic Ckts & Communication (2×6 Hours) (100 Marks) <br> b) Computer Programming (1×6 Hours) (50 Marks) | 2 | 150 | 8 |
| ICT-206: | Viva-Voce | 0.5 | 50 | 2 |
| ICT-207: | Tutorial, Terminal, Class Test and Class Percentage | 0.5 | 50 | 2 |

## Related Courses

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| MATH-214: | Matrices & Differential Equations | 1 | 75 | 4 |
| CST-R104: | Discrete Mathematics & Numerical Methods | 1 | 75 | 4 |
| STAT-209: | Theory of Statistics | 1 | 75 | 4 |
| | **2nd Year (Totals)** | **9.5** | **750** | **38** |

## 3rd Year : Examination-2005

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| ICT-301: | Microwave Communication | 1 | 75 | 4 |
| ICT-302: | Telecommunication Systems, Networks and Switching | 1 | 75 | 4 |
| ICT-303: | Digital Communication | 1 | 75 | 4 |
| ICT-304: | Data Communication | 1 | 75 | 4 |
| ICT-305: | Object-Oriented Programming with Java | 0.5 | 50 | 2 |
| ICT-306: | Computer Graphics | 1 | 75 | 4 |

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| ICT-307: | Satellite and Fiber Optics Communication | 1 | 75 | 4 |
| ICT-308: | Data Structure and Algorithms | 0.5 | 50 | 2 |
| ICT-309: | Practical-III: (30 Hours)<br>a) Digital Electronics and Communication (2×6 Hours) (Marks-75)<br>b) (i) Electronics Workshop and Computer Hardware Practice (Marks-50) (1×6 Hours)<br>(ii) Graphics, Data Structure & Computer Programming (Marks-75) (2×6 Hours) | 2.5 | 200 | 10 |
| ICT-310: | Viva-Voce | 0.5 | 50 | 2 |
| ICT-311: | Tutorial, Terminal, Class Test & Class Percentage | 0.5 | 50 | 2 |
| | 3rd Year (totals) | 10.5 | 850 | 42 |

## 4th Year : Examination-2006

| Course no. | Course title | Unit | Marks | Credit |
|---|---|---|---|---|
| ICT-401. | Computer Networks and Communication | 1 | 75 | 4 |
| ICT-402. | Computer Architecture and Microprocessor Organization | 1 | 75 | 4 |
| ICT-403. | Database Management Techniques | 0.5 | 50 | 2 |
| ICT-404. | Communication System Modeling, Simulation and Software | 1 | 75 | 4 |
| ICT-405. | Virtual Environment and Multimedia | 1 | 75 | 4 |
| ICT-406. | Artificial Intelligence and Neural Computing | 1 | 75 | 4 |
| ICT-407. | Information System Analysis and Design | 1 | 75 | 4 |
| ICT-408. | Practical-IV (24 Hours)<br>i. Micro-Processor and Communication (Marks-100) (2×6 Hours)<br>ii. DBMS, AI, Simulation, Modeling and Multimedia (Marks-100) (2×6 Hours) | 2.5 | 200 | 10 |
| ICT-409. | Research Project (6 Hours) | 0.5 | 50 | 2 |
| ICT-410. | Viva-Voce | 0.5 | 50 | 2 |

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| ICT-411. | Tutorial, Terminal, Class Test, Class Percentage and Study Tour | 0.5 | 50 | 2 |
|---|---|---|---|---|
| | **4th Year (Totals)** | **10.5** | **850** | **42** |
| | **Grand Totals** | **40** | **3200** | **160** |

## Overall Marks, Unit and Credit Distributions

| Year | Course | Unit | Marks | Credit |
|---|---|---|---|---|
| First Year | Theoretical (Major & Related) | 7.5 (3.5+4) | 575 (275+300) | 30 (14+16) |
| | Practical | 1 | 75 | 4 |
| | Viva-Voce | 0.5 | 50 | 2 |
| | Tutorial, Terminal, Class Test & Class Percentage | 0.5 | 50 | 2 |
| | **Total** | **9.5** | **750** | **38** |
| Second Year | Theoretical (Major & Related) | 6.5 (3.5+3) | 500 (275+225) | 26 (14+12) |
| | Practical | 2 | 150 | 8 |
| | Viva-Voce | 0.5 | 50 | 2 |
| | Tutorial, Terminal, Class Test & Class Percentage | 0.5 | 50 | 2 |
| | **Total** | **9.5** | **750** | **38** |
| Third Year | Theoretical (Major only) | 7 | 550 | 28 |
| | Practical | 2.5 | 200 | 10 |
| | Viva-Voce | 0.5 | 50 | 2 |
| | Tutorial, Terminal, Class Test & Class Percentage | 0.5 | 50 | 2 |
| | **Total** | **10.5** | **850** | **42** |
| Fourth Year | Theoretical (Major only) | 6.5 | 500 | 26 |
| | Practical | 2.5 | 200 | 10 |
| | Research Project | 0.5 | 50 | 2 |
| | Viva-Voce | 0.5 | 50 | 2 |
| | Tutorial, Terminal, Class Test & Class Percentage and Study Tour | 0.5 | 50 | 2 |
| | **Total** | **10.5** | **850** | **42** |
| | **Grand Total** | **40** | **3200** | **160** |

**ICT-101:**          **Electronics**       75 marks, 1 unit

**Network and Circuit Analysis:** Kirchhoff's laws, Wheatstone bridge, Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem. Maximum power transfer theorem, Mesh and node circuit analysis, Reduction of complicated network, T and $\Pi$- section network. Analysis of series and parallel circuits for RLC, general AC theory, AC power, Average and R.M.S. value of AC voltage and current, Resonant circuit, Q- value and Bandwidth, Frequency response.

**Semiconductor Devices:** N and P type semiconductor, PN Junction diodes and their V-I characteristics, Zener diode, Varacter diode.— 2o2

**Diode Circuits:** Rectifier concept, Half wave and Full wave rectifiers, Voltage doubler, Voltage regulators, Clippers, Clampers. → 187702

**Bipolar Transistor:** CE, CB and CC configuration, Stabilization, Biasing, Operating point, Load lines (AC and DC), Current gain, Voltage gain, Power gain, Input impedance, Output impedance, Analysis of small signal low frequency transistor amplifier by using h-parameters.

**FET:** Types of FET, Construction, Characteristics curve, Principle of operation, Channel conductivity, Channel ohmic and pinch-off region, Characteristics parameter of the FET, Effect of temperature on FET, Common Source AC amplifier, Common Drain amplifier, Depletion type and Enhancement type MOSFET.

**Feedback and Oscillators:** Concept of Feedback, negative feedback, positive feedback, voltage and current feedback, virtual feedback, effect of feedback on impedance, gain, bandwidth and distortion, condition of oscillation and stabilization, Hartley oscillator, Colpitt oscillator. Phase shift and Wein bridge oscillators, Resonant circuit oscillators.

**Micro-Electronics:** Micro electronic Technology, Planer processor, Bipolar Transistor fabrication, FET fabrication, CMOS technology, Monolithic diodes, Metal semiconductor contact; IC resistor and capacitor, IC packing; characteristics of IC components, Microelectronic circuit layout, printed circuit board.

**Filters:** Properties of symmetrical networks, Characteristics impedance, Filter- fundamentals, Different types of filters, Constant -K and m- Derived filters, Design conditions.

## Books Recommended:

| | | |
|---|---|---|
| 1. | Allen Mottershead | : Electronic Devices and Circuits |
| 2. | Millman and Halkias | : Electronic Devices and Circuits |
| 3. | S.L Gupta and V. Kumar | : Handbook of Electronics |
| 4. | M.Cirovie | : Basic Electronics and Devices |
| ৫. | মোঃ মোজাক্ষর হোসেন | : ইলেকট্রনিক্স |
| 6. | J.D Ryder | : Networks, Lines and Fields |
| 7. | V.K. Mehta | : Principal of Electronics |
| 8. | J. Millman and Grabel | : Microelectronics |
| 9. | B.L. Theraja and A.K. Theraja ~~Vol- II~~ IV | : A Text Book of Electrical Technology |
| 10. | Bernard Grobe | — Basic Electron |

ICT-102: **Electromagnetic Fields, Waves and Antenna**   75 marks, 1 unit

**Field Equations:** Field equations based on laws of Coulomb, Ampere and Faraday; Displacement current; Maxwell's equation; Units and dimensions of field vectors; E-H symmetry; Lorentz's lemma; Scalar and Vector potentials; Retarded potentials.

**Propagation of Electromagnetic Waves:** Wave equations; plane wave concept; Plane electromagnetic waves in free-space, in conducting, dielectric and in ionized media. Poyinting vector; joule heating in good conductors; Intrinsic impedance and propagation constant.   02

**Reflection and Refraction of Electromagnetic Waves:** Boundary conditions; The laws of reflection and Snell's law of refraction; Reflection from dielectrics and conductors; Fresnel's equations; The Brewster angle; Total reflection; Skin effect; phase and group velocities, Reflection and refraction in the Ionosphere.

**Transmission Lines:** Transmission line equations and parameters; transmission line configuration and formulae; Transmission line at radio frequency; Impedance matching; Line termination; Smith chart; SWRQ and band width; Balanced and unbalanced feeder from transmitter to antenna; Transmission at audio frequency; Distortionless line.

**Wave Guides:** Rectangular and cylindrical wave-guides, Micro strip lines and their characteristics.

**Antenna:** Antenna fundamentals, Dipole antenna, Current and voltage distribution, Electrical length, Radiation resistance and patterns, Antenna tuning and coupling; Hertz and Marconi antenna.

**Different Types of Antennas:** Thin Linear Antenna; Antenna arrays; Broadcast tower antenna; Grounding system of the tower antenna. Helical, Rhombic, Horn antenna and their uses, Loop antenna, Turnstile antenna, Periodic and parasitic antenna, Yuagi antenna.

## Books Recommended:

| | | |
|---|---|---|
| 1. | J.D. Ryder | : Networks, Lines and Fields |
| 2. | Bronwell and Beam | : Theory and Application for Microwave |
| 3. | Corson and Lorain | : Introduction to Electromagnetic Field and Wave. |
| 4. | G Markov | : Antenna |
| 5. | J.D. Kraus | : Antenna |
| 6. | Laport | : Antenna |

**ICT-103:  Pulse and Digital Electronics**                         75 marks, 1 unit

**Switching Circuits:** Switching concepts of Diodes, Transistors; Wave Shaping: The high-pass and low-pass RC circuits (Sinusoidal, step voltage, pulse, square wave, exponential and ramp inputs), Attenuator, RL circuits, RLC circuits, and Ringing circuits.

**Stable States and Regenerative Switching:** Introduction to the multivibrator, The bistable multivibrator, The monostable multivibrator, The astable multivibrator, Other forms of multivibrator, Uses of multivibrator, Schmitt trigger.

**Boolean Algebra and Logic Gates:** Boolean algebra, Boolean function and expressions, Minimization of Boolean functions, Electronic logic circuits, Logic gates (DTL, RTL, TTL, ECL, MOS), Electronic logic gates application.

**Combinational Logic Circuits:** Adders, Subtractors, Boolean function implementation, Carry propagation, Magnitude Comparator, Encoder, Decoder, Multiplexer, Demultiplexer, PLA.

**Sequential Logic Circuits:** Difference between combinational circuits and sequential circuits, Flip-flops, Analysis and design of sequential

circuit, Shift registers, Synchronous and Asynchronous sequential circuits.

**Integrated Circuits as Digital System:** Digital integrated circuits, SSI, MSI, LSI and VLSI logic gates, Flip-flop, Registers, Counters, Coder, Decoder, Multiplexer and Demultiplexer, A/D and D/A converters.

**Memories:** Semiconductor memories, RAM, ROM, EPROM, Magnetic core memories.

## Books recommended

1. Jacob Millman and Herbert Taub : Pulse, Digital and Switching Wave Forms.
2. G.K. Mithal and Vanwasi : Pulse and Digital Electronics.
3. Joseph M. Pettit and Malcolm M. Mewhorter : Electronic Switching Timing and Pulse Circuits.
4. V.K. Jain : Switching Theory and Digital Electronics.
5. M. Mouris Mano : Digital and Computer Design
6. Neschalski : Digital Computer.
7. Artaick : Microcomputer Interfacing
8. S.C. Lee : Digital Circuit and Logic Design.
৯. সাইদুর রহমান খান ও মোঃ মোজাফফর হোসেন : পালস ও সুইচিং বর্তনী
10/ Ronald J. Tocci Neal Widmur — Digital systems

**ICT- 104:** <u>**Computer Fundamentals**</u>          50 marks, 1/2 unit

**Introduction:** Early computing devices, generation of computers, different computer systems, mainframe, mini, microcomputer etc., Computer and society, computer crime and security system, analog and digital computer, functional units of a digital computer.

**Number Systems:** Digital systems, Radix, Radix conversion, Binary codes.

**Computer Hardware Fundamentals:** Basic units of computer hardware, Keyboard, Mouse, Different types of monitors, Different parts of system unit, Internal structure of CPU, Function of RAM, ROM and cache memory, Basic functional mechanism of FDD, HDD, CD-ROM, Impact and Non-Impact printers.

**Computer Software Fundamentals:** Overview of software, types of software, operating system and system software, introduction to BIOS,

DOS, WINDOWS, UNIX, booting process of a computer, introduction to some application of software, types of software, programming languages, levels of languages, compiler and interpreter.

**Application:** Multimedia systems, Computer networks, Basic concepts on LAN, WAN, Internet system, E-Mail, E-Commerce, WAP and WWW.

**Information and Data Processing:** Data organization, Types of data processing, Data processing cycles, Centralized data processing, Distributed data processing, Database management systems.

## Books Recommended:

1. H. L. Capron and K. Williams : Computer and Data Processing
2. Charles S. Parker : Computer and Their Application
3. R. M. Stair : Principles of Data Processing
4. V. Rajaraman : Fundamentals of Computers
5. Warford : Computer Science
6. L. Rosch : Hardware Bible
7. P. Norton : ~~Inside the PC~~ Introduction to computer

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**MATH-112:** **Algebra, Trigonometry and Vector Analysis** 75 marks. 1 unit

1. a. Algebra of sets, DeMorgan's rule, relation & function
   b. **Determinants:** Properties and Cramer's rule.
2. **Theory of Equations:**
   a) Theorem and relation between roots and coefficients.
   b) Solution of cubic equations.
3. a) De moiver's theorem
   b) Deduction from De Moiver's theorem.
4. a) Functions of complex arguments.
   b) Gregory's series.
5. a) Summation of series.
   b) Hyperbolic functions.
6. Vector addition, multiplication & differentiation.
7. Vector differential operator-grad. div. and curl.

## Books Recommended:

1. Barnside and Panton : Theory of Equations
2. Barnside and Child : Higher Algebra

3. Hall and Knight : Higher Algebra
4. Das and Mukherjee : Higher Trigonometry
5. M.A. Sattar : Higher Trigonometry
6. M.R. Spiezel : Vector Analysis
7. M.A. Sattar : Vector Analysis

**MATH-115:** **Differential Calculus and Integral Calculus** 75 marks, 1 unit

## Group-A

1. **Functions:** Domain, range, inverse function and graphs of functions, limits, continuity, and indeterminate form.
2. **Ordinary Differentiation:** Differentiability, differentiation, successive differentiation and Leibnitz theorem.
3. a) **Expansions of Functions:** Rolle's theorem, mean value theorem, Taylor's and Maclaurin's formulae.
   b) Maximum and minimum of functions of one variable.
4. a) **Partial Differentiation :** Euler's theorem, tangents and normal.
   b) Asymptotes.

## Group - B

5. **Indefinite Integrals:** Method of substitution, integration by parts, special Trigonometric functions and rational fractions.
6. **Definite Integrals:** Fundamental theorem, general properties, and evaluations of Definite integral and reduction formulas.
7. **Multiple Integrals:** Determination of length, areas and volumes.

## Books Recommended

1. F Ayres : Calculus
2. B.C. Das & B.N. Mukherjee : Differential Calculus
3. B.C. Das & B.N. Mukherjee : Integral Calculus
4. Edwards : Differential Calculus
5. Williamson : Integral Calculus
6. K. Muhammad & P.K. Bhattacherje : Differential Calculus
7. K. Muhammad & P.K. Bhattacherje : Integral Calculus

## STAT- R01: Elementary Statistics & Probability 75 marks, 1 unit

1. **Statistics:** Meaning & Scope, Variables & Attributes. Collections and presentation of statistical data. Frequency distribution and Graphical Representation.

2. **Analysis of Statistical Data:** Location. Dispersion and their measures. Skewness. Kurtosis and their measures; Moment and cumulants.

3. **Elements of Probability:** Sample Space. Events. Union and Intersection of Events. Probability of Events. Loss of probability. Frequency limit and probabilities. Addition law of probability. Application to Occupancy problems, Bose-Einstein statistics, Fermi-Dirac statistics, Conditional probabilities. Bayes probability. Chebysev's Inequality.

4. **Random Variables and Probability Distribution:** Basic concepts. Discrete and continuous random variables. Density and distributional functions. Mathematical expectation and variance. conditional expectation and conditional variance, expected values and variance of the density distributions. Moments and cumulants generating functions, Characteristics function. Study of Binomial, Poisson, Normal. Geometric, Negative binomial, Hypergeometric, Multinomial. Cauchy and Wibul distribution.

## Books Recommended:

1. Anderson, A.J.B : Interpreting Data, Chapman & Hall, London
2. Cramer H. : The Elements of Probability Theory, Wiley N.Y
3. Hoel. P. G : Introductory Statistics, Wiley & Sons,N. Y
4. Lindley, D.V. : Introduction to Probability and Statistics, Vol. I, CUP London
5. Lipschutz, S : Probability, McGraw- Hill, N.Y.
6. Mosteller, Rouke & Thomas : Probability with Statistical Applications; 2nd Ed. Addison-Wesley.
7. Wolf, F.L. : Elements of Probability and Statistics; McGraw- Hill, N.Y.
8. Wonnacot. T.H. Wonnacot, R.J. : Introductory Statistics. 3rd Ed. Wiley and Sons. N.Y.
9. Yule & Kendall M.G. : An Introduction to the Theory of Statistics; 4th ed. Charles Griffin, London.

**APE- R102:** **Applied Electricity and Magnetism**   75 marks, 1 unit
**Electrostatic and Steady Electric Current:** Coulomb's Law, Gauss's Law and its Application; Electric field in dielectric media; Energy in a

electrostatic field: Concept of electric current density; Equation of continuity; Ohm's Law; Resistivity and conductivity; Electromotive force;

**Magnetic Field and Its Interaction:** Magnetic induction; Magnetic force on a charge; Lorentz force; Magnetic field of a current; Torque on a current loop; Moving coil galvanometer, Biot-Savart's law and its applications; Ampere's law; Ammeter and Voltmeter.

**Electromagnetic Induction:** Faraday's law of electromagnetic induction; Lenz's law, Induced current and voltage; Self-inductance and mutual inductance; Energy stored in a magnetic field.

**Varying Current:** Circuit elements; Transients in RC, RL and LRC circuits; Solution by means of Laplace Transformation.

**Alternating Current:** General AC theory; AC power, Average and RMS value of AC Voltage and current; Use of complex quantities in AC circuits; Resonant circuits; Q-value and Bandwidth; Measurement of AC quantities.

**Transformers:** Transformer action, Transformer construction; Loading a Transformer, Equivalent circuit of Transformer, Tests of Transformer, Transformer regulation, Efficiency of Transformer, Different types of Transformer, Three- phase Transformer.

**Chemical Effects of Current:** Faraday's laws of electrolysis; storage cells; changing system; Electroplating.

**Thermoelectricity:** Thermal electromotive forces; Seeback effect and peltier effect; Laws of addition of thermal Electromotive forces; Thermoelectric power; Thermocouple.

**Illumination:** Illumination laws; various kinds of lamps; Lighting scheme; Flood lighting.

**Books Recommended:**

1. B.L. Theraza : Electrical Technology
2. A.K. Haque, Ratiqullah & : Concepts of Electricity and A.K. Roy  Magnetism
3. Bernard Grobe : Basic Electronics
4. R. Resnick and D. Halliday : Physics, part -II
5. Arthur Kip : Fundamentals of Electricity and Magnetism
6. J.D. Ryder : Networks, Lines and Fields
7. Joseph Edminister : Electric Circuits

ICT-201: **Analog Communication** 75 marks, 1 unit

**Radio Wave Propagation:** Surface and space wave propagation, Sky wave through Ionosphere. Theory of Eccles and Larmor; Pulse method for measuring height and electron concentration of Ionospheric region; Chapman theory of layer formation, Ionospheric storm.

**Modulation and Demodulation:** Linear modulation -AM, DSB, SSB and VSB, Envelope and Synchronous detection, carrier recovery-squaring loop, costas loop, PLL Circuit to generate linear modulated signals, low and high power modulators, Exponential modulation- FM, PM and Thin spectra. Pulse modulation and generation, spectra and demodulation of AM, FM, PAM, PWM, PPM signals.

**Broadcasting Transmitter and Standard Broadcast Stations:** Element of transmitter stabilized master oscillator, Frequency multipliers, Mixer exciters, RF power amplifier, AM and FM transmitter, Transmitter performance-carrier frequency stability, audio frequency response, distortion, signal to distortion ratio. Components of a broadcast system, the broadcast console, Audio levels, Frequency Monitoring, modulation monitors, Emergency broadcast systems, Disk recording, playback records and reproduction.

**Radio Receiver:** Receiver classification, TRF and Super heterodyne receiver, Principle of AM receiver, Super heterodyne receiver, pulse receiver, Point to Point receiver, Military receiver, Marine receiver, Receiption and preselection, FM receiver-FM receipt ion, Comparison of AM and FM receiver, AFC circuit, Ratio detectors, AM and FM receptions, Noise in receiver, Noise limiting circuits, AGC circuits, Receiver sensitivity, Cross modulation, Spurious responses, Converters, Detectors and modulation circuits, Servicing transistor receiver, receiver trouble shootings.

**Fundamentals of TV:** Transmission and reception of picture information, Scanning; Standard scanning pattern; Synchronization; Blanking pulses; Composite video signal, vestigial sideband transmission, TV channels.

**TV Camera Tubes:** Storage type camera tubes, Non-storage type camera tubes; Iconoscope; Image orthicon; Vidicon; Plumbicon, Color TV camera and other types of camera tubes.

**TV Receiver:** Fundamentals of TV receiver; picture tubes, Deflection circuit, High voltage power supply, Folded dipole with directors and reflectors for TV Receiver.

**Color TV:** Definition of color TV; Types of color video signals, matrix circuits; colorplexed composite video signal; Fundamental of color TV receiver; Color picture tube; Chrominance; ACC Bias; color trables, TV receiver servicing.

**TV Broadcasting System:** TV transmitter; TV studio, TV recording, optical recording, Magnetic recording, TV film projectors, TV relay systems, microwave relay system; Cable relay system; Satellite relay system. TV transmitting antenna.

## Books Recommended

1. W. Eaul Stewart : Magnetic Recording Technique
2. B. Grob : Basic TV
3. A. Schure : Basic TV
4. Fowler and Liport : TV Fundamental
F 5. Gulati : Monochrome and Color TV
6. S.L. Gupta and Kumar : Electronics
7. Ghirardi and Johnson : Radio TV Receiver Circuitry and Operation
8. H.R. Sturly : Radio Transmitter and Receiver
9. Keith Herry : Radio Engineering Hand book
10. G.K Methal : Radio Engineering .

**ICT-202: Electronics Circuit & Semiconductor Devices** 75 marks, 1 unit

**Multistage Amplifier:** Amplifier coupling, RC coupled two-stage amplifier, Advantages of RC coupling, Impedance coupled two-stage amplifier, Advantages of Impedance coupled amplifier, Transformer coupled two-stage amplifier and its advantages, disadvantages and applications, DC two-stage amplifier and its advantages, disadvantages and applications, Darlington pair, Comparison between Darlington pair and emitter follower, Multistage frequency effect.

**Power Amplifiers:** Classification of power amplifiers, Collector efficiency, Transformer coupled class-A amplifier, Push-pull amplifier. Tuned amplifier.

**Low-Frequency Response:** Effect of emitter bypass capacitor, effect of coupling capacitor, cascading of CE stage; Mid-frequency gain, low-frequency response of cascaded stages. Transformer coupled amplifier.

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**High-Frequency Response**: High frequency model for CE amplifier. CE short circuit current gain. High frequency current gain with resistive load, High frequency response of cascaded CE stages, Transformer coupled amplifier, Transistor Noises.

**Operational Amplifier**: Difference amplifier, CMRR, Ideal operational amplifier, Inverting amplifier, Non-inverting amplifier, Differential amplifier, General-purpose IC operational amplifier, Integrator, Differentiator, Precision Rectifier.

**Active Filter**: Types of filters, Low-pass filter: First order low-pass Butter worth filter, Second order low-pass Butter worth filter, High-pass filter: First order high-pass Butter worth filter, Second order high-pass Butter worth filter, Higher order filters, Band-pass filters; Wide Band-pass filter, Narrow Band-pass filter, Band Rejected filters; Wide band rejected filters, Narrow band rejected filters, All-pass filters.

**Optoelectronic Devices**: PN photo diode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic sensors, LED, LCD, Alphanumeric Display, Photo couplers, high-speed optical detectors.

**Semiconductor Devices**: Tunnel diode, Thyristor, SCR, UJT, Diac and Triac, Semiconductor sensors and detectors, Microwave transistors, PIN diode switches, IMPATT and BARITT diodes.

## Books Recommended

1. Alien Mottershead : Electronic Devices and Circuits
2. Millman and Halkias : Electronic devices and Circuits
3. S.L Gupta and V. Kumar : Handbook of Electronics
4. M. Cirovie : Basic Electronics and Devices
৫. মোঃ মোজাফফর হোসেন : ইলেকট্রনিক্স
6. B.L. Theraza : Electrical Technology
7. Ramakant A. Gayakwad : OP-Amps and Linear Integrated Circuitry
8. Malvino : Electronic Principles

ICT-203: **Computer Programming with C/C++**    75 marks, 1 unit

**Introduction**: Programming organization, Structured and non structured programming, concepts of algorithm, and its use in programming, use of flow charts

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**C Programming Fundamentals:** Constants, Variables, Keywords, Data types; C instructions; Hierarchy of operations, Programming structure of C.

**Decision Making and Looping:** If statements, if-else statements, else if statement, nesting while loop, for loop, nesting of for loop. the do loops, Break and Continue statements. do- while loop, case control structure.

**Arrays and Functions:** One dimensional array; two dimensional array; array initialization; C function and its structure; passing values between functions. Scope rules of function; nesting and recursion of function; call by value and call by reference, passing array elements to a function; Introduction to pointers; pointer notations; Array and pointers; Function and pointers.

**String Operation:** What are string; Declaring and initializing string variables; String I/O operations standard library string functions, Two-dimensional array of characters; Array of pointers to string and its limitations, Concept of C preprocessors.

**Structures:** Need for structure; Declaring structure type, Accessing structure element, Array of structure, Array within structure, Structure within structure; Structure and functions; structure and pointers.

**I/O in C :** Type of I/O , Console I/O, Disk I/O , File opening and closing, I/O redirection in DOS.

**Object-Oriented Programming:** Classes, Constructors and Destructors, Pointers to classes. Overloading Operators, this, Static members, Relationships between classes: friend, Inheritance, Virtual Members, Abstraction, Polymorphism.

**Advanced Concepts:** Templates, Namespaces, Exception handling. Advanced classes, type-casting. (new cast and typeid operators). Preprocessor directives, Graphics functions.

<u>**Books Recommended:**</u>

1. E. Balagurushamy : Programming ANSI C
2. Kernighan and Ritche : The C Programming Language
3. Herbert Schieldt : Turbo C/C++: The Complete Reference
4. W.H. Murray and C.H. Pappas : Visual C/C++ Programming
5. Gotfried : Programming with C
6. 6. Herbert Schieldt : The Complete Reference C

**ICT-204:** **Telegraphy, Telephony and Acoustic Engineering** 50 marks. 1/2 unit

**Telegraphy:** Introduction, Historical background, telegraph codes, telegraphic instruments, telegraphic circuits. Basic principles of FDM and TDM. Telegraphy Channels and relays, Electronic Teleprinter, Telex, Facsimile telegraph. News paper transmitter, voice frequency telegraphy (VFT), submarine cable telegraphy.

**Mobile and Cellular Telephony:** Historical developments, trunking efficiency, propagation criteria, Mobile radio environment, Elements of cellular radio system design. Specification, channel capacity, cell coverage for signal and traffic, Mobile switching and traffic, cellular system, GSM, AMPS, Mobile communication protocols, cellular digital packet data. CDMA system.

**Audio Architectural Systems:** Electrical, Mechanical and Architectural elements and systems of element, Reverberation theory; optimum reverberation in auditorium, studio and lecture room; Measurement of reverberation time and its correction; Absorption of sound and absorption co-efficient.

**Audio Devices:** Pressure microphone and pressure gradient microphone, calibration of microphones. Loudspeakers and horn loudspeakers, Testing of loudspeakers, Ultrasonic and their applications, Mechanical disks, Magnetic and optical means of recording and reproduction of sound, the artificial ear and stereophony.

**Books Recommended:**

1. Atkinson : Telegraphy and Telephony
2. N.N. Biswa : Telephony
3. P.N. Das : Telephony
4. Y. Lee (K) : Mobile Cellular Communication System
5. H.F. Olson and : Applied Acoustics
   F. Messa
6. J.L. Hunter : Applied Acoustics

**MATH- 214:** **Matrices and Differential Equations** 75 marks, 1 unit

### Group-A

1. Algebra of matrices, Adjoint, inverse and rank of matrix-definition, properties and evaluation.

2. Elementary transformations-echelon, canonical and normal forms.
Solution of system of linear equations-consistency and solution of homogeneous and nonhomogeneous systems by matrix method, and reduction to equivalent system.
3. Characteristic equation, eigenvalues, eigenvectors and Caley-Hamilton theorem, Similar matrices and diagonalization.

## Group- B

4. Solutions of first order and first degree, and first-order and higher degree equations with variable coefficients.
5. Solution of higher-order linear differential equations. $4.2-4.5$
6. Differential Equations: Series solution of linear differential equation, Series solution of second order equation with variable coefficients, Solutions of partial differential equation, Laplace's equation Poisson's equation, Helmholtz's equation, diffusion equation, Green's function solution, Integral equation.

## Book Recommended:

1. F. Ayres             :  Theory and Problems of Matrices.
2. Moduffe              :  Theory of Matrices
3. M.L. Khanna          :  Matrices
4. S.L. Ross            :  Introduction of Ordinary Differential Equation
5. F. Ayres             :  Differential Equations
6. B.D. Sharma          :  Differential Equations
7. L. Pipes             :  Applied Mathematics for Engineers and Physicist
8. I.S. Sokolniko F.F.  :  Mathematics for Physics and Modern & R.M. Redheffer   Physics

CST-R104: **Discrete Mathematics and Numerical Method**          75 marks. 1 unit

**Mathematical Logic:** Connectives, normal Forms, theory of inference for proposition calculus, predicate calculus, inference theory of predicate calculus, methods of proof, mathematical induction.
**Sets:** Basic concept of set theory, operation of sets, ordered pairs and n-tuples.

**Relation and Ordering:** Relations, properties of binary relation in a set, composition of binary relation, relation matrix and graph of a relation, partial ordering, path in relation and digraph.

**Functions:** Definition, composition of function, inverse function, binary and array operation.

**Ordered Relation and Structure:** Partially ordered set, extremal element of Poset, Lattice, finite Boolean algebra, function on Boolean algebra, Boolean functions as Boolean polynomials.

**Graph:** Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, shortest path problems, graph coloring, matrix representation of graph.

**Trees:** Introduction of trees, application of trees, tree traversal, labeling trees, trees and sorting, spanning trees, minimal spanning tree, undirected trees.

**Algebraic Structure:** Algebraic system, general properties, some simple algebraic system.

**Semigroup and Monoids:** Homomorphism of semigroups and monoid, Grammars and languages, Formal definition of a language.

**Group:** Definition and examples, Homomorphism, Product and Quotients of groups.

**Numerical Methods:** Solutions of polynomials and transcendental equations, Interpolation and polynomial approximation, Least square approximation; Solutions of systems of linear equations Gauss elimination technique; Gauss-siedel iteration technique; Numerical Differentiation and Integration; Numerical Solutions of Ordinary Differential Equations.

**Books Recommended:**

Lipshutz : Theory and Problems of Discrete Mathematics, Schaum's Outline Series

O. Nicodem : Discrete Mathematics, CIAS, 1980

C.L. Liu. : Elements of Discrete Mathematics 2nd Ed, McGraw-Hill, 1985

Tremble and Mohan : Elements of Discrete Mathematical Models with Computer Applications, McGraw- Hill Book Company

Manna and Waldinger : The Logical Basic for Computer Programming, Addison-Wesley

6. K. H. Rosen : Discrete Mathematics and its Applications, Random House, 1988
7. B. Kolman R.C. Busby : Discrete Mathematical structures
8. Donals F. Stanat David S. Ross, F. McAllister : Discrete Mathematics in Computer Science.
9. J.L. Mott A. Kandel T.P. Baker : Discrete Mathematics for Computer Scientists & Mathematicians.

**STAT-209:** **Theory of Statistics** 75 marks, 1 unit

**Sampling Distribution:** Fisher's Lemma, Study of $\chi^2$-Distribution, T-Distribution and F-Distribution. Properties, uses & Applications. Distribution of sample correlation coefficient in the null case, Sampling Distribution of the Medians and Range.

**Elements of Point Estimations:** Basic Concepts, Consistent estimates, unbiased estimates, Mean and variance of estimated Ideas of Efficiency, Principle of Maximum Likelihood, Illustration from Binomial, Poisson & Normal Distributions.

**Decision Rules:** Statistical decisions, Statistical hypothesis: Critical region, best critical region, two types of errors, Procedure of test of hypothesis, most powerful test, and standard Errors.

**Test of Significance:** Test of single mean & single variance, Comparison of two sample Means, proportions and variances, Bartlett's test for homogeneity of variances, Test for correlation and Regression coefficients, Exact test for $2\times2$ tables, Test for $r\times c$ tables, Three-way contingency tables, Large Sample Test of Significance, Non-Parametric Test, One Sample and two Sample Sign Test, Run Test and Rank Sum Test.

**Books Recommended:**

1. Anderson R.L. Bancorft T. A : Statistical Theory in Research, McGraw-Hill N.Y. Banctoft, T. A.
2. Beaumont, G. : Intermediate Mathematical Statistics, Third Ed. Chapman and Hill London.
3. Gutman, Wills and Hunter : Introductory Engineering Statistics Fourth Ed. John Wiley and Sons, N. Y
4. Hoel, P. G. : Introduction to Mathematical Statistics Fourth Ed. Wiley and Sons, N.Y.

5. Hogg. R.V. and : Introduction to Mathematical Statistics
   Graig. A.T.        fourth Ed. collier Macmilan. N. I.Y.
6. Kendall M.G. and : The advanced Theory of Statistics Vol. I.
   Stuart A.          Fourth Ed. Charles. Griffin and Co. London
7. Lindgren. B.W. : Statistical Theory. Third Ed. Collier-
                      Macmillan Co. N.Y.
8. Mood, Graybill : Introduction to the Theory of Statistics.
   and Boes          third Ed. McGaraw-Hill. N.Y.
9. Weatheril. G.B. : Intermediate Statistics Methods, Chapman
                      and Hall, London.

## Third Year

**ICT-301:** **Microwave Communication** 75 marks, 1 unit

**Microwave Link:** Microwave link and its advantage. Frequency assignment and modulation methods, Transmitting and receiving equipment. Base band repeater, IF repeater. Microwave carrier supply. Auxiliary channels, Microwave antenna.

**Microwave Components and Devices:** Circuit theory for wave guide system. T-Junction, Magic-T, Hybrid-T, Step Transformer, cavity. Filter. Excitation of wave guide, Probe and aperture coupling, Directional coupler, Planer microwave components.

**Microwave Measurement Techniques:** Microwave components and measuring instruments, precision measurement of electrical parameters of microwave sources and network elements, Measurement based on transmission and reflection. Radiation pattern measurements, Antenna . range design and evaluation, frequency response test set. TDR systems.

**Maser and Laser Communication:** Basic principles of masers, Ammonia maser, solid-state laser, semiconductor and gas laser; Microwave transducer for laser communication. Application of maser and laser in telecommunication and satellite communication, Microwave relay system.

**Radar:** Basic principle, Radar equation and range. Factor influencing maximum range, Effect of noise, power, Frequency used in radar, Types of radar, CW and FM radar: Doppler effect MTI and pulse radar: Duplexer radar receiver, Indicator and timers: Altimeter and IFR equipment: Tracking radar systems and search systems. SONAR, Lens and parabolic antenna for radar and navigation.

**Radar Signal Processing:** Analysis of discrete time signal, sampl[ing] theorem. estimation of frequency content in a signal, discrete Fou[rier] transforms. random discrete signal, analysis Review of probability, a[nd] and cross correlation. Power spectral density. Spectral analysis random signal, Optimum detection algorithms. Neyman-Pear[son] criteria for radar, application to air traffic control, Bayes estimator.

### Books Recommended:

1. Thorp : Masers and Lasers.
2. D. Raddy and Coolen : Electrical Communication.
3. M. I. Skolnik : Introduction to Radar System.
4. S. Haykin : Communication System.
5. J.C. Hancock : An Introduction to the Communicatio[n] Principles and Communication Theo[ry]

ICT-302. **Telecommunication Systems, Networks and Switching** 75 marks. 1 u[

**Introduction:** Simple Telephone Communication, Basic switchi[ng] system, Transmission Bridge. Subscriber line circuit, CB cord circu[it] Junction working.

**Strowger Switching Systems:** Relay dial telephone, signaling tone[ strowger switching components, step-by-step switching, Desi[gn] parameters. 100-line switching system. 1000-line blocking exchang[e] 10,000-line exchange.

**Crossbar Switching:** Principles of common control; touch tone di[al] telephone, principles of crossbar switching, crossbar swit[ch] configuration, cross point terminology, crossbar exchange organization No. 1 ESS. Japanese D-10, Metaconta, Digital switching system.

**Electronic Switching:** Stored program control, centralized SP[C] software architecture, Application software, Enhanced services, Two[-] stage network, Three-stage network, n-stage network. Concepts [of TDM, Basic time division space switching. Basic time division tim[e] switching, Time multiplexed space switching. Time multiplexed tim[e] switching, combination switching. Three-stage combination switching n-stage-combination switching.

**Traffic Engineering:** Network traffic load and parameters. Grade o[f service and blocking probability. Modeling switching systems Incoming traffic and service time characterization. Blocking model[s and loss estimates, Delay systems

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**Telephone Networks:** Subscriber loop systems. switching hierarchy and routing, transmission plan, Transmission systems, Numbering plan, charging plan, signaling techniques, Inchannel signaling, common channel signaling, Integrated service digital network: Motivation for ISDN, New services, Network and protocol architecture. Transmission channels, User-network interfaces, signaling, numbering and addressing, service characterization, Interworking, ISDN standards, Expert systems in ISDN, Broadband ISDN voice data integration.

## Books Recommended:

| | | | |
|---|---|---|---|
| 1. | M. T. Hills | : | Telecommunication Switching Principle. |
| 2. | Thiagrajan Viswanatham | : | Telecommunication Switching Systems And Networks. |
| 3. | J.Y. | : | Using ISDN |
| 4. | J.C. Bellam | : | Digital Telephony. |

ICT-303: **Digital Communication** 75 marks, 1 unit

**Signals and Systems:** Discrete time signals, sequences, linear self-invariant systems, stability and casuality, linear constant coefficient, difference equations, Frequency and time domain, FT, DFT, FFT, Convolution, Correlation, Auto- correlation.

**Digital Communication:** Sending analog signal by discrete techniques, Pulse amplitude modulation. Demodulation of PAM, Time division multiplexing, Pulse width modulation; Pulse position modulation, A/D and D/A converters, Coded communication; Pulse code modulation, Delta modulation, Adaptive Delta modulation, Digital carrier system, Sources of error in digital communication systems, FAX, E-mail, ISDN.

**Digital Communication Techniques:** Base band, narrow band and wideband signals and noise representation and characteristics, characteristics of communication channels. Linear and Optimum filtering, Base band binary signal transmission, line codes, Marry signals, orthogonal representation. Gram-Schmidt procedure, signal space concepts, Bandwidth efficient digital modulation techniques, carrier synchronization, spread spectrum techniques, codes, transmitters, receivers, performance.

**Digital Voice and Picture Communication:** Digital speech communication; Digital TV Communication; Characteristics of speech signals; Characteristics of picture signals; Subjective and objective testing; Bit rates in speech and picture communication, CCITT recommendation for speech digitization, HDTV Low resolution TV and Video conferencing requirements; Time domain waveform coding of speech; Frequency domain waveform coding of speech; parameter coding of speech - channel; coding of monochrome and colour video signal; Audio and Video conferencing, Video telephone.

**Digital Image Processing:** Digital image fundamentals, Image enhancement. Segmentation, matching and registration, Digital geometry and its applications.

## Books Recommended:

1. M.S. Roden : Analog and Digital Communication Systems
2. Oppenheim and : Digital Signal Processing
   Schaffer
3. J.C. Hancock : An Introduction to the Communication Principles and Communication Theory
4. Rabiner and Gold : Theory and Application of Digital Signal Processing.
5. Oppenhium : Signals & Systems.

ICT-304: **Data Communication** 75 marks, 1 unit

**Introduction:** Background, Data communication concept, A communication model, Data communication tasks, Data communication network, Standards and Organization, Introduction to OSI and TCP/IP models, queuing Theory.

**Data Transmission:** Analog and digital data, spectrum and bandwidth, Transmission requirements, Data rate and channel capacity. Asynchronous and synchronous data transmission techniques, Error detection techniques, parity checks and CRC, Error correction and Hamming code. Data compression, Huffman coding, dynamic Huffman coding, Interfacing and EIA, 232D. or RS-232C, Null modem connection, Data compression algorithms, Facsimile compression.

**Transmission Media:** Characteristics and applications of Twisted pairs, coaxial cables and optical fibers. Terrestrial and satellite minor axis, radio waves, VSAT.

**Data Encoding:** Data and Signal. NRZL, Manchester and different Manchester encoding. ASK, FSK, PSK, QPSK, QAM encoding, modems, sampling theorem, pulse code modulation techniques.

**Data Link Control:** Line configuration, Flow control and error control techniques- sliding windows, stop and wait ARQ, Selective reject ARQ and HLDLC project.

**Multiplexing:** Frequency division multiplexing, international FDM carrier standards, synchronous time division multiplexing, international TDM carrier standards, statistical time division multiplexing, Wavelength division multiplexing.

**Communication Devices:** RJ-11 and RJ-45 standard connectors, NIC, Hub, Switch, Bridge, Router, ADSL and ISDN modems.

**Data Communication Networking:** Circuit switching, signal mode networks, space division and TDM switching, time slot interchange, digital private branch exchange, packet switching, comparison of circuit and packet switching.

**Books Recommended:**

1. W. Stallings        :   Data and Computer Communications
2. F. Halsall          :   Data Communication Computer Network and Open Systems.
3. A.S. Taneanbaum     :   Computer Network.

ICT-305:   **Object Oriented Programming with Java**      50 marks, 1/2 unit

**Concepts of Object Oriented Programming:** Class, Object, Abstraction, Encapsulation, Inheritance, Polymorphism.

**Introduction to Java:** History of Java, Java Features and advantages, Creating classes with Java, Concept of constructors, Using JDK

**Variables, Data Types, and Operations:** Variables, data types, and operations, Variables, Data types, Integer data types, Increment and decrement operators, Floating-point data types, Numeric promotion, Conversion and casting, Operator precedence, Character and Boolean data types.

**Control Flow:** Control flow, Command-line arguments, The if statement, The if/else statement, The switch statement, Relational

operators. Logical operators. The while statement. The for statement. The do statement. The break statement. The continue statement.

**Methods:** Using methods. Declaring a class method. Calling a class method. Passing parameters. Local variables and variable scope.

**Arrays:** Arrays. Introduction to arrays. Declaring an array variable. Creating an array. Computation of array stored values. Using arrays

**Using Standard Java Packages:** Creating Graphical user interfaces with AWT. Managing graphics objects with GUI layout Managers. Event handling of various components

**Exception Handling:** Overview of exception handling. The basic model. Hierarchy of Event classes. throw clause. throws statement. try-catch block.

**Streams and Input/Output Programming:** Java's File Management techniques. Stream manipulation classes

**Books Recommended:**

1. John Zukowski        :    Mastering Java 2
2. Herbert Schildt       :    The Complete Reference of Java 2

**ICT-306:**          **Computer Graphics**          ✸          75 marks, 1 unit

**Mathematics for Computer Graphics:** Co-ordinate reference frames, Points and Vectors, Basis Vectors and Matrices tensor, matrices, complex number, numerical methods, quaternions, parametrics and Non-parametric representation, Fitting curves to data sets.

**Overview of Graphics System:** Video display devices: CRT, Color CRT Monitor, Flat Panel displays, LCD, Raster and random scan systems, input devices.

**Output Primitives and Its Attributes:** Point and Lines, Frame buffer, Line function. Algorithm for line, circle, ellipse and some other curves generation. DDA line drawing algorithm, pixel addressing and object geometry. Filled area primitives. character generation. character generation.

**Two Dimensional Geometric Transformation and Viewing:** Basic transformation, matrix representation, composite transformation, transformation between co-ordinate systems. Reflection and shear transformation, raster method for transformation. Viewing pipeline, viewing co-ordinate reference frame, window to viewport co-ordinate

transformation, clipping operation on point, line, area, curve and text clipping.

**GUI and Interactive Input Method:** User dialogue, Input of graphical data, input functions, Interactive picture construction technique.

**Three Dimensional Object Representation:** 3D display methods, polygon surface, quadratic surfaces, superquadrics, blobby objects, spline representations, cubic spline, interpolation methods, Baizer curve and surfaces, B-spline curves and surfaces, beta splines, rational splines, conversion between spline representation, displaying spline, curves and surfaces, sweep representation, fractal geometry method, visualization of data sets, Elimination of hidden surface, Z-buffer algorithm, Painters algorithm, Scan line algorithm.

**3D Modeling and Viewing:** Modeling: Translation, Rotation, Scaling, Modeling and co-ordinate transformation. Viewing: Viewing pipelines and co-ordinate, Projections, View volume and general projection transformation, Hardware implementations, 3D viewing functions.

**Color Models and Color Applications in Computer Graphics:** Properties of light, Intuitive color concepts, RGB color model, YIQ color model, CMY color model, HSV color model, Conversion between HSV and RGB models, color selection and application.

**Recommended Books:**

1. Michael E. Mortson : Mathematics for Computer Graphics Application

2. D. Hearn and M.P. Baker : Computer Graphics C Version, Printice-Hall, 1997

3. Foley and Co-authors : Computer Graphics Principles and Practice, Addison Wesley, 1996, 2nd Ed in C.

4. Allan Watt : 3D Computer Graphics

ICT-307: **Satellite and Fiber Optics Communication** 75 marks, 1 unit

**Satellite Communication Systems:** Evolution and growth of communication satellites, Kepler's laws of motion, orbits, Altitude control, satellite lunch vehicles - Arian, SLV space shuttle, sub systems of communication satellite: Spectrum allocation and Bandwidth consideration, Propagation characteristics, satellite transponders and other sub systems; Earth station technology: Analog and digital link

design; Multiple access techniques- FDMA, SPADE, TDMA, SS-TDMA; Interference in FDMA systems.

**Digital Satellite Communication:** Nonlinear satellite channel; TDMA; frequency reuse, satellite switched TDMA; time slot arrangement, frame and buest synchronization; scanning spot beam; multiple scanning beam systems; efficient use of orbit and spectrum; satellite switching and on board processing; Digital speech interpolation; echo and delay cancellation, satellite tracking and data acquisition network; maritime and broadcast satellite communication system; Intersatellite links; Integrated satellite networks.

**Optical Communication Systems:** Principles of light wave propagation through fibers; material and types of fibers, attenuation, Dispersion and pulse spreading; short and long wave length; Light sources-principles, technology, Characteristics and modulation; photo detectors- principles. Technology, parameters, characteristics and noise consideration; Receiver amplifiers; Fiber optic components and cables, Fiber optic communication systems, High bit rate electronics; integrated optics.

**Fiber Optics Metrology:** Transverse backscatter method of measurement diameter, deformation, lecentricity, ellipticity. Refractive index profile measurement, attenuation measurement, cut back method, backscattering technique (OTDR), differential mode attenuation. Dispersion measurements; Time and frequency domain techniques; differential mode delay, measurement of monomode fibers, mechanical properties of fibers; fiber optic measuring instruments.

**Fiber Optic Technology:** Common Glasses, optical glasses. optical fiber materials, fiber perform making; reaction nineties and efficiency, instrumentation, fiber fabrication processes, fiber drawing and cooling, Jacketing and cabling, splicing,

**Books Recommended:**

1. J. Martin      : Communication Satellite System.
2. Carter        : Communication Satellite
3. Barnoski      : Fundamental of Optical Fiber Communication
4. Chrin         : An introduction to Optical Fiber
5. J.M. Senior   : Optical Fiber Communication

# ICT-308: Data Structure and Algorithms 50 marks, 1/2 unit

**Introduction:** Data types and data structures, data structure operations, Relationship between algorithm and data structures, Measures of algorithm efficiency, Average case and worst case analysis.

**Arrays, Records and Pointer:** Linear arrays, Relationships of arrays, Operation on arrays, Multidimensional arrays, pointer arrays, Record structures, representation of records, Sparse matrices.

**Stacks, Queues and Recursion:** Fundamentals, Different types of stacks and queues: circular, dequeues, etc., Evaluation of expressions. recursion, direct and indirect recursion, depth of recursion, Implementation of recursive procedures by stacks.

**Linked List:** Linked lists, representation of linked list, traversing and searching a linked list, Doubly linked list and dynamic storage management, Generalized list, Garbage collection and compaction.

**Trees and Graphs:** Basic terminology, Binary trees, Binary tree representation, Tree traversal, Extended binary tree, Huffman codes/algorithm, Graphs, Graph representation, Shortest path and transitive closure, Traversing a graph.

**Sorting and Searching:** Sorting, Bubble sort, Insertion sort, Selection sort, Shell sort, Quick sort, Heap sort, Merge sort, Radix sort, Sorting on several keys, Sorting with disk, K-ways merging, Buffer handling for parallel operation, Searching and data modification.

**Symbol Tables:** Static tree tables, Dynamic tree tables, Hash tables overflow handling, Theoretical evaluation of overflow techniques.

**Files:** Files, Queries and sequential organizations, Indexing techniques, cylinder-surface indexing, Hashed indexes, Tree indexing.

## Books Recommended:

1. E. Horowitz and S. Sahni : Fundamentals of data structures
2. Reingold : Data structures
3. Robert L. Kruse : Data structures and Program design
4. Niklaus Wirth : Algorithms-Data structure-Program
5. Lipschutz : Theory and Problems of Data Structures
6. E. Horowitz and S. Sahni : Computer Algorithm

# Fourth Year

ICT-401: __Computer Networks and Communication__       75 marks, 1 unit

**Introduction:** Network types, Network architecture, protocol hierarchies, layers interfaces, outline of OSI and TCP/IP reference models.

**LAN and MAN:** Topologies Bus/ Tree and star using metallic media, optical fiber bus; the ring topology/ Medium access control protocols, MAC performance, LAN/ MAN/ standards, high speed LANs / FDDI, Fast Ethernet.

**WAN:** Public data networks, packet switching, data gram and virtual circuits, routing, traffic control and X.25 standard, circuit switched data networks and X.21 interface.

**ISDN and Broadband ISDN:** ISDN- principles, user interface and services, ISDN channels, user access and protocols, broadband ISDN-functional architecture and protocols,

**Frame Relay and Cell Relay:** Spectrum of switching techniques, Frame relay services and protocols. ATM overview, virtual channels and paths, ATM cells, header error control, ATM switches.

**Inter Networking:** Network inter-connection, bridges and gateway, connectionless and connection oriented internetworking, routing and fragmentation, control protocols- ICMP, ARP, RARP, multicasting, domain name system and name servers.

**Communication:** Communication channel, terminals, multipliers, concentrators, Routing and flow control case study of computer communication networks.

**Applications:** Simple network management protocol, Telnet and FTAM, Electronic mail-x. 400 and SMTP protocols, FTP, The WWW client and servers, writing web page in HTML, Java locating information on the web, video on demand, MBone-Multicast backbone.

## Books Recommended:

1. A. S. Tanenbaum    :    Computer Networks
2. W. Stallings    :    Data and Computer Communication
3. F. Halsall    :    Data Communication, Computer Network and Open Systems.

**Design Methodology:** Introduction, combinational circuits, sequential circuits, the register level, register-level components, design method, the processor-level, processor-level components, design techniques.

**Microprocessor Design:** Evolution of microprocessor, microprocessor organization, information representation and number formats, instruction set, instruction formats, series of Intel and Pentium microprocessor, microprocessor applications.

**Arithmetic Logic Unit:** Fixed-point arithmetic, addition, subtraction, multiplication and division ALU design basic ALU organization, floating-point arithmetic, and arithmetic processor.

**Control Design:** Introduction; Instruction sequencing, instruction interpretation, Hardwired control, multiplier control unit, CPU control unit, micro programmed control; microinstruction, micro programmed sequencer.

**Memory Organization:** Memory devices and characteristics, RAM. organization, serial access memory; virtual memory, memory hierarch, main-memory allocation, segments and pages, High speed memories; interleaving, cache memory, associative memory,

**System Organization:** Microcomputer organization, communication, bus concepts, Bus control, arbitration, programmed I/O, Interrupt controlled I/O, DMA, I/O processors.

**I/O Interfaces and Bus Standards:** I/O hardware; processor bus, interface circuits, standard I/O interfaces, SCSI, IEE-488(GPIB) bus standard; computer peripherals; video terminals, remote terminal, video displays flat plane displays, printers, secondary storages; magnetic disk systems, tape system, CDROM system.

**Pipelining and Parallel Processing:** Basic concept of pipelining, instruction queue, branching etc; forms of parallel processing, classification of parallel processing structure, array processor, structure of general purpose multi-processor, interconnection networks.

**Books Recommended:**

| | | |
|---|---|---|
| John P. Hayes | : | Computer Architecture and Organization |
| Barry B. Brey | : | Microprocessor Hardware Interfacing & Application |
| Morris Manno | : | Digital Logic and Computer Design |
| P. Pal Choudhury | : | Computer Organization & Design. |

ICT-403: **Database Management Techniques**   50 marks, 1/2 un

**Overview:** Definition of DBMS, types of DBMS, advantage disadvantages, applications.

**Database Design:** Logical database design, physical database design data storage device and data format.

**File Organization:** Sequential file organization, Index fi organization, direct file organization, hashing methods, searching sequential search, index search; reporting; simple and complex report.

**Relational Database System:** Relational model, normalization relational data base design; relational query language; SQL.

**Database Administration:** Functions; standards, security, integrity recovery, concurrency control; coronations; quality control; tuning an performance, multiple file database general considerations, designin the files, data entry and consistency, data updating, tools for comple database manipulations.

**Other Types of DBMS:** Object oriented database, Network database hierarchical database text-oriented database, graphic-oriented database

**Programming:** Common programming applications, importan programming attributes; access to database records and fields; sorting searching, transactions among files, procedures and function, reporting standard complex customized etc; structured aspects, variables an arrays; Handling database based on relational network, hierarchica model; Programming projects, Create projects using menu builders screen builder, form builder, report builder, etc: object oriente database programming.

**Books Recommend:**

1. Gerry M. Litton         : Introduction to Database
                             Management System,
                             A Practical Approach.
2. Joseph A. Vaste        : Understanding Database
                             Management Systems
3. James Martin           : Principle of Database Management
4. Uillman                : Database Management Systems.
5. A. Silberschatz, H. F.  : Database System Concepts.
   Korth and S.Sudarshan

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**ICT-404:** <u>Communication System Modeling, Simulation and Software</u>    75 marks, 1 unit

*Computer Simulation Methods:* Introduction to simulation, Monte-Carlo simulation; Generation of random variables, uniform random variables, congruential methods, Functional transformation of random variables, PNS generation, Generation of Gaussion random variables, Simulation of communication systems in time and frequency domain.

**Modeling:** Introduction to modeling techniques, problems, models and systems, Modeling concepts, simulation model for interactive communication systems, block simulator; simulation of error sources in digital channels; channel simulation, satellite link, optical communication link, optimization of communication system design; stochastic gradient method; least squares method; packet radio simulation; collision resolution algorithms; telecommunication programming; stored program control switching systems, CCITT programming languages.

**Books Recommended:**

1. J.A. Spriet         :    Computer Aided Modeling & Simulation.
2. R.S. Lehman      :    Computer Simulation and Modeling.
3. G. Cordon          :    System Simulation.

**ICT-405:    <u>Virtual Environment and Multimedia</u>**    75 marks, 1 unit

**Multimedia:** Understanding multimedia, definitions of multimedia; taxonary of multimedia objects.

**Multimedia Application Environments:** Business and industry; press, education; entertainment; medicine and nursing; encyclopedic resource,

**Multimedia Hardware:** Multimedia standards; multimedia computer components. Multimedia tools and techniques. Text; graphics; waveform audio recording, digital video recording, Hypertext mark-up language; HTML Elements; HTML structure.

**Multimedia Database:** OO multimedia database system structures. OO Multimedia Programming: Java, Java script. Designing multimedia applications, designing principles, designing simple multimedia system, design of advanced applications, making hypertext.

**The Future of Multimedia:** Multimedia frontiers, emerging technology, social uses, virtual environment technology.

**Spatial Tracking Systems:** Technology and techniques behind head trackers etc.

**Visual Display Technology:** Devices, HMDS, stereopsis, distortions and corrections, Haptic display systems, tactile and force feedback systems, auditory systems, 3D audio localization.

**Synthetic Environments:** Distributed collaborative working telepresence, multi- user environments, future directions, Human factor issues, HCI.

**Application Case Studies:** Medicine, Avionics, Entertainment.

**Books Recommended:**

1. John Vince : Virtual Reality Systems.
2. John Villamil Casonova, Louis Molina : Multimedia, Production, Planning and Delivery
3. John Villamil Casanova, Louis Molina : Multimedia An Introduction.
4. John Villamil-Casanova, Leony Fernardez Flias : Multimedia Graphics.
5. John Villamil-Casanova, Louis Molina : Multimedia Sound & Video.
6. John Villamil-Casanova, Louis Molina : Multimedia on WEB.

ICT-406: **Artificial Intelligence & Neural Computing** 75 marks, 1 unit

**Introduction:** Nature and goals of AI, Historical background Comparison of conventional and neural computation, overview of network architectures and learning paradigms.

**Reasoning and Problem Solving:** Derivation of consequences from facts, Different characterisations of reasoning, Reasoning with uncertainty, Probabilistic reasoning, Use of states and transitions searching of state spaces, Breath first, Depth-first, and related types of search, Brief revision of propositional and predicate calculus

**The Future of Multimedia:** Multimedia frontiers, emerging technology, social uses, virtual environment technology.

**Spatial Tracking Systems:** Technology and techniques behind head trackers etc.

**Visual Display Technology:** Devices, HMDS, stereopsis, distortions and corrections, Haptic display systems, tactile and force feedback systems, auditory systems, 3D audio localization.

**Synthetic Environments:** Distributed collaborative working, telepresence, multi-user environments, future directions, Human factor issues, HCI.

**Application Case Studies:** Medicine, Avionics, Entertainment.

**Books Recommended:**

1. John Vince : Virtual Reality Systems.
2. John Villamil Casanova, Louis Molina : Multimedia, Production, Planning and Delivery
3. John Villamil Casanova Louis Molina : Multimedia An Introduction.
4. John Villamil-Casanova, Leony Fernardez Flias : Multimedia Graphics.
5. John Villamil-Casanova, Louis Molina : Multimedia Sound & Video.
6. John Villamil-Casanova, Louis Molina : Multimedia on WEB.

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Connection of logic with programming, Forward and backward chaining, Resolution.

**Knowledge Acquisition and Representation:** Knowledge acquisition, Survey of types of knowledge, Survey of available representation, Conceptual graph, Frames, Scripts, cases and particularized knowledge, case-based reasoning.

**Introduction to Selected Topics in AI:** Game Playing, Planning, Understanding, Natural language processing, Expert system, Genetic algorithm, Robotics and Fuzzy logic.

**Neural Networks:** The MaCullough Pitts model, Hopfiled model, Networks of binary neurons, Perceptrons and their limitations.

**The Multilayer Perceptron:** Hidden units and Feature detectors, Training by error backpropagation, The error surface and local minima, Generalized and cross validation, Reinforcement learning.

**Introduction and General Concept of Pattern Recognition:** Introduction to statistical pattern recognition, Neural pattern recognition, Introduction to neural pattern associates and matrix approaches and unsupervised learning to neural pattern recognition.

**An Overview of Artificial Intelligence Programming Language:** Prolog, Visual Prolog, LISP etc.

**Books Recommended:**

1. Partt, I. Macmillan : Artificial Intelligence.
2. Generserth, Michael R, and : Logical Fundamentals of AI.
   Nilsson Nills
3. I. Brat-Ko : Prolog Programming for AI.
4. Generserth, Michael R, and : Logical Fundamentals of AI.
   Nilsson Nills

ICT-407: **Information System Analysis and Design**      75 marks, 1 unit

**Introduction:** Introduction to information systems, General design consideration of information systems.

**Overview:** System concepts and the information systems environment, information needs, the concepts of MIS, the system development life cycle, the role of the system analyst.

**System Analysis:** System planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost benefit analysis.

**System Design:** The process and stages of system design. Input/output and forms design, file organization and database design.

**System Implementation:** System testing and quality assurance, implementation and software maintenance, hardware software selection, project scheduling and software, security, discaster/recovery and ethics in system development.

**Case Studies of Various Information Systems Such As :** Library management system, inventory system, voter identity management system, payroll system, etc.

**Books Recommended:**

1. E. M. Awad : System Analysis and Design
2. P. Edward : System Analysis and Design
3. J. G. Burch Jr. F.R. Straton and Grundnitski : Information System
4. G. Scott : Principle of Management Information System.
5. A. Daniels and D. Yeates : Basic System Analysis.