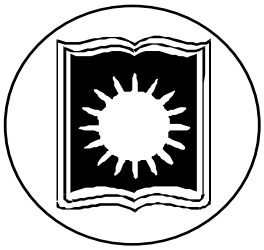
University of Rajshahi

Department of Information and Communication Engineering

Syllabus for B.Sc. (Honors)

Session: 2008-2009



Examination

1st Year - 2009

2nd Year -2010

3rd Year - 2011

4th Year - 2012

The B.Sc. (Honors) courses in Information and Communication Engineering shall be offered over the period of four academic years. No students shall be allowed to stay for more than two academic years in each of the 1st, 2nd and 3rd year of the program. Courses consisting of theoretical, practical, viva-voce, class assignment/ tutorial/ terminal/ home assignment, thesis/ project and attendance are of 4000 Marks. One and half unit courses carry 100 marks, 4 credits and 50 marks, 2 credits respectively.

Degree requirements: The degree shall be awarded on the basis of Cumulative Grade Point Average (CGPA) obtained by a candidate in B. Sc. (Honors) Part-1, Part-2, Part-3 and Part-4 examinations. In order to qualify for the degree B.Sc. (Honors), a candidate must have to obtain the following within six academic years from the date of admission:

(i) A minimum CGPA of 2.50,
(ii) A minimum GPA of 2.00 in the practical courses in each of Part-1, Part-2, Part-3 and Part-4 examinations,
(iii) A minimum total credit point (TCP) of 160, and
(iv) "S" letter grade in English course (the details are given in the grading system section. The letter grade "S" corresponds to at least 30 % marks).

Promotions: In order to be eligible for promotion from one class to the next higher Honors class, a candidate must secure (i) at least 2.00 GPA in each of his/her Part-1, 2.25 GPA in Part-2, and 2.50 GPA in Part-3 examinations(ii) at least 2.00 GPA in each of Part-1, Part-2, Part-3 and Part-4 practical course examinations(iii) 30 credits for each of Part-1 and Part-2, and 34 credits in Part-3 examinations.

Eligibility for examinations:

a) Percentage of Attendance: In order to be eligible for taking up the B.Sc. (Honors) examinations, a candidate must have pursued a regular course of study by attending not less than 75% of the total number of classes held (theoretical, practical, class, assessment etc.) provided that the academic committee of the department on special grounds and on such documentary evidence that may be necessary, may condone the cases of shortage of attendance not below 60%. A candidate, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the syndicate for the purpose. Candidates having less than 60% attendance shall not be allowed to fill up the examination form.

b) Readmission*:* A candidate, who failed to appear at the examination or fails to pass the examination, may on the approval of the relevant department be admitted to the immediate following session in the first, second, third or fourth year of the program. A readmitted candidate shall have to reappear at all course examinations

The Grading System:
Letter Grades (LG), Corresponding Grade (CG), Grade Point (GP) and Credit Points (CP) shall be awarded in accordance with provisions shown below.

Table-3

a) Table of LG, GP, and CP for non credit course

Numerical Grade	LG	GP/unit	CP/unit
80% or its above	A+ (A plus)	4.00	4
75% to less than 80%	A (A regular)	3.75	4
70% to less than 75%	A- (A minus)	3.50	4
65% to less than 70%	B+ (B plus)	3.25	4
60% to less than 65%	B (B regular)	3.00	4
55% to less than 60%	B- (B minus)	2.75	4
50% to less than 55%	C+ (C plus)	2.50	4
45% to less than 50%	C (C regular)	2.25	4
40% to less than 45%	D	2.00	4
Less than 40%	F	0.00	0
Incomplete	I	--	0

Absence from the final examination shall be considered incomplete with the letter grade "I".

b) Table of LG, GP, and CP for non credit course

Numerical Grade	LG	GP/unit	CP/unit
30% and above	S	0.00	0.00
Less than 30%	U	0.00	0.00

Here S and U refer to satisfactory and unsatisfactory respectively.

Calculation of Grade Point Average (GPA) & Cumulative Grade Point Average (CGPA):

The weighted average of the grade points obtained in all the courses by a student and Total Credit Point (TCP) shall be calculated from the following equations:
GPA= Sum of $[(CP)_i \times (GP)_i]$/sum of $(CP)_i$;
TCP=Sum of $(CP)_i$,
The weighted average of GPAs of a student in all four years shall be calculated from the following equation:
CGPA= Sum of $[(TCP)_j \times (GPA)_j]$/Sum of $(TCP)_j$
where, $(GP)_i$= grade point obtained in individual course $(CP)_i$= credit point for respective course, $(GPA)_j$=grade point average obtained in a year

and $(TCP)_j$= total point for that year. GPA and CGPA shall be rounded off up to two places after decimal to the advantage of the examinee. For instance, GPA=2.112 shall be rounded off as GPA=2.12.

Course Improvement: A promoted student earning a grade less than 2.75 individual courses shall be allowed to improve the grades of courses not more than two full unit courses of Part-1, Part-2, and part-3 examinations or the equivalent courses (in case of changes in the syllabus), defined by the departmental academic committee, through the regular examination of the immediate following batch. No improvement shall be allowed in practical course examinations/viva-voce/class assessment/tutorial/terminal/home assignment and thesis/dissertation/project/in-plant training courses. If a candidate fails to improve his/her course grade, the previous grade shall remain valid. If a readmitted candidate fails to appear at the class assessment/tutorial/terminal/home assignment and thesis/dissertation/project/in-plant training courses, his/her previous grades shall remain valid.

Result Improvement: A candidate obtaining a CGPA of less than 2.75 at the end of Part-4 examinations, within 6 academic years, shall be allowed to improve his/her result, on up to a maximum of 4 full units of the Part-4 theoretical courses in the immediate next regular examination after publication of his/her result. No improvement shall be allowed for practical courses examinations/viva-voce/class assessment/tutorial/terminal/home assignment and thesis/dissertation/ project/in-plant training courses. If a candidate fails to improve CGPA with the block of new GP in total, the previous results shall remain valid.

Pass degree: Candidates failing to obtain required GPA, (i) for promotions in Honors Part-3 examination in 4 academic years, in case of readmission in Part-3 course year, or 5 academic years, with no readmission part-3 course year from the date of admission, or (ii) for Honors degree in Honors Part-4 examination in 6 academic years from the date of admission but secure (a) a CGPA of at least 2.00 (ignoring TCP) up to Honors Part-3 examination and (b) obtain a letter grade of "S" in the English course in 4 academic years from the date of admission, shall be awarded a B. Sc. Pass degree. Such candidate shall not be allowed to improve on the B. Sc. Pass degree.

Dropping out: Candidates failing to earn the yearly required GPA after completing regular examinations and subsequently failed again after taking readmission in 1st, 2nd or 3rd year shall be dropped out of the program.

First year: Examination –2009

Course no.	Course title	Unit	Marks	Credit
ICE-101:	Electronics	1	100	4
ICE-102:	Computer Fundamentals	0.5	50	2
ICE-103:	Digital Electronics	1	100	4
ICE-104	Computer Programming	1	100	4
ICE-105:	Practical-I (12 Hours) a) Electrical and Electronic Circuits b) Computer Programming	1	100	4
ICE-106:	Viva-Voce	0.5	50	2
ICE-107:	Tutorial, Terminal, Class Test and Class Percentage	0.5	50	2

Related Courses:

MATH-112:	Algebra, Trigonometry and Vector Analysis	1	100	4
MATH-115:	Differential Calculus, Integral calculus	1	100	4
STAT-R01:	Elementary Statistics and Probability	1	100	4
APE-102	Applied electricity and Magnetism	1	100	4
ICE-108	English	0.5	50	0
	1st Year (Totals)	**9.5**	**950**	**38**

Marks distribution (ICE-105)

i)	Continuous assessment	=	30
ii)	Two experiments (2×6 hours), 2×30	=	60
iii)	Table viva voce 2×5	=	10
			100

Second year: Examination-2010

Course no.	Course title	Unit	Marks	Credit
ICE-201:	Analog Communication	1	100	4
ICE-202:	Electronic Circuits and Semiconductor Devices	1	100	4
ICE-203:	Electromagnetic Fields and Waves	1	100	4
ICE-204:	Data Structures and Algorithms	1	100	4
ICE-205:	Discrete Mathematics and Numerical Methods	0.5	50	2
ICE-206:	Signals & Systems	0.5	50	2
ICE-207:	Practical-II (18 Hours): (a) Electronic Circuits and Communication (2×6 Hours) (100 Marks) (b) Data Structures and Algorithms (1×6 Hours) (50 Marks)	1.5	150	6
ICE-208:	Viva-Voce	0.5	50	2
ICE-209:	Tutorial, Terminal, Class Test and Class Percentage	0.5	50	2
Related Courses:				
MATH-214:	Matrices and Differential Equations	1	100	4
STAT-209:	Theory of Statistics	1	100	4
	2nd Year (Totals)	**9.5**	**950**	**38**

Marks distribution (ICE-207)

i)	Continuous assessment	=	45
ii)	Three experiments (3×6 hours), 3×30	=	90
iii)	Table viva voce 3×5	=	15

Third year: Examination-2011

Course no.	Course title	Unit	Marks	Credit
ICE-301:	Microwave Communication and Radar	1	100	4
ICE-302:	Telecommunication Systems, Networks and Switching	1	100	4
ICE-303:	Digital Communication	1	100	4
ICE-304:	Digital Signal Processing	1	100	4
ICE-305:	Java and Network Programming	1	100	4
ICE-306:	Digital Image Processing	0.5	50	2
ICE-307:	Satellite and Optical Fiber Communication	1	100	4
ICE-308:	Antenna Engineering	0.5	50	2
ICE-309:	Practical-III: (30 Hours) (a) Microwave and Antenna Engineering (Marks-50) (1×6 Hours) (b) Digital Signal & Image Processing (Marks-50) (2×6 Hours) (c) Digital Communication (Marks-100) (1×6 Hours) (c) Network Programming (Marks-50) (1×6 Hours)	2.5	250	10
ICE-310:	Viva-Voce	0.5	50	2
ICE-311:	Tutorial, Terminal, Class Test and Class Percentage	0.5	50	2
	3rd Year (totals)	**10.5**	**1050**	**42**

Marks distribution (ICE-309)

i)	Continuous assessment	=	75
ii)	Five experiments (5×6 hours), 5×30	=	150
iii)	Table viva voce 5×5	=	25
			250

Fourth year: Examination-2012

Course no.	Course title	Unit	Marks	Credit
ICE-401:	Computer Networks and Communications	1	100	4
ICE-402:	Computer Architecture and Organization	1	100	4
ICE-403:	Database Management Techniques	0.5	50	2
ICE-404:	Wireless Communications	1	100	4
ICE-405:	Information Theory and Coding	1	100	4
ICE-406:	Artificial Intelligence Neural Computing	1	100	4
ICE-407:	Cryptography and Network Security	1	100	4
ICE-408:	Practical-IV (30 Hours) (i) Micro-Processor & Micro Controller (Marks-50) (1×6 Hours) (ii) Communications & Coding Theory (Marks-100) (2×6 Hours) (iii) DBMS (Marks-100) (1×6 Hours) (iv) Cryptography and Network Security (Marks-100) (1×6 Hours)	2.5	250	10
ICE-409:	Research Project (6 Hours)	0.5	50	2
ICE-410:	Viva-Voce	0.5	50	2
ICE-411:	Tutorial, Terminal, Class Test, Class Percentage and Study Tour	0.5	50	2
	4th Year (Totals)	**10.5**	**1050**	**42**
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	Grand Totals	**40**	**4000**	**160**

Marks distribution (ICE-408)

i)	Continuous assessment	=	75
ii)	Five experiments (5×6 hours), 5×30	=	150
iii)	Table viva voce 5×5	=	25
			250

Overall Marks, Unit and Credit Distributions:

Year	Course	Unit	marks	Credit Point
First Year	Theoretical	7.5	750	30
	English (noncredit)[1]	0.5	50	0
	Practical[2]	1.0	100	4
	Viva-voce	0.5	50	2
	Continuous Assessment[3]	0.5	50	2
	Total	**9.5**	**950**	**38**
Second Year	Theoretical	7.0	700	28
	Practical[2]	1.5	150	6
	Viva-voce	0.5	50	2
	Continuous Assessment[3]	0.5	50	2
	Total	**9.5**	**950**	**38**
Third year	Theoretical	7.0	700	28
	Practical [2]	2.5	250	10
	Viva-voce	0.5	50	2
	Continuous Assessment[3]	0.5	50	2
	Total	**10.5**	**1050**	**42**
Fourth year	Theoretical	6.5	650	26
	Practical [2]	2.5	250	10
	Research Project	0.5	50	2
	Viva-voce	0.5	50	2
	Continuous Assessment[3]	0.5	50	2
	Total	**10.5**	**1050**	**42**
	Grand Total	**40**	**4000**	**160**

[1]A candidate shall not be allowed to continue the B.Sc. Honors program if he/she fails to obtain the letter grade "S" in the English course in 4 academic years from the date of admission. The letter grade "S" corresponds to at least 30% marks.
[2]30% of the total practical marks shall be allotted for continuous laboratory assessment.
[3]20% of the assessment marks shall be awarded for the attendance in the class on the basis of the following table.

Marks on Attendance

Attendance	Marks	Attendance	Marks	Attendance	Marks
95-100%	20%	90-95%	18%	85-90%	16%

80-85%	14%	75-80%	12%	70-75%	10%
65-70%	8%	60-65%	60%	<60%	00%

FIRST YEAR

ICE – 101: Electronics

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Semiconductor Diodes: Semiconductor materials N-type and P-type Semiconductor, Semiconductor diode, Diode equivalent circuit, rectifier diode, Zener diode, varactor diode and their V-I Characteristics.

Diode Applications: Load line analysis and concept of rectifier, half wave rectifier, full wave rectifier, voltage regulator using zener diode, clippers, clampers, Voltage-Multiplier circuit.

Bipolar Transistor: Transistor construction and operation. CB, CE and CC configuration and their I/O characteristics, transistor amplifying action, operating point, load line, stabilization, biasing, hybrid equivalent model.

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.

Power Amplifiers: Definition, classification of power amplifiers, performance quantities of power amplifiers, series fed class A amplifier, transformer coupled class A Amplifier, Class B operation and amplifier circuits, Push-Pull 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.

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

Books Recommended:

1. R L Boylestad : Introductory Circuit Analysis
2. R L Boylestad : Electronic Devices and Circuits Theory
3. Millman and Halkias : Electronic Devices and Circuits

4. ‡gvt †gvRvddi †nv‡mb : B‡jK‡Uwb ·

5. Gupta & Kumar : Handbook of Electronics

ICE – 102: Computer Fundamentals

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration: 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

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.

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. Charles S. Parker : Computer and Their Application;

2. R. M. Stair : Principles of Data Processing
3. V. Rajaraman : Fundamentals of Computers
4. P. Norton : Introduction to Computer

ICE – 103: Digital Electronics

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration: 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Number Systems: Binary Numbers, Number base conversion, Octal and Hexadecimal Numbers, Complements, Binary Codes, Binary Logic.

Boolean Algebra and Logic Gates: Basic definitions, Axiomatic definitions of Boolean algebra, Basic theorem and properties, Boolean functions. Canonical and standard forms, Digital Logic Gates, Electronic logic gate circuits (DDL,DTL,RTL,TTL).

Simplification of Boolean Functions: Map Method, Two and three variable maps, Four variable map, five and six variable maps, Sum of Product and Product of sum simplification, NAND & NOR implementation, Don't care conditions, Tabulation Method, Determination and selection of Prime Implicants.

Combinational Logic: Design Procedure, Adders, Subtractors, Boolean Code conversion, Multilevel NAND, NOR, ExclusiveOR and their equivalence function, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Encoder, Decoder, Multiplexer, De-multiplexer, PLA.

Sequential Logic: Flip-Flops, Triggering of Flip-flop, Master-Slave Flip-flop, Analysis of clocked sequential circuits, Flip-flop excitation tables, Design Procedure, Design of counters, Design with state equations.

Applications: Registers, Shift registers, Ripple Counters, Synchronous Counters, RAM, ROM, EPROM, EEPROM, A/D and D/A converters.

Books recommended.

1. M. Morris Manno : Digital and Computer Design

2. V.K. Jain : Switching Theory and Digital Electronics.

3. S.C. Lee : Digital Circuit and Logic Design.

4. Tocci & Widmer Digital Systems

5. mvB`i ingvb Lvb I : cvjm I mBwPs eZbx
‡gvt †gvRvddi †nv‡mb

ICE – 104: Computer Programming

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

C Programming Fundamentals: History of C, Importance of C, Programming structure of C, Constants, Variables, Keywords and Identifiers, Data types, Operators, Type Conversion in Expression, Reading a Character, Writing a Character.

Decision Making and Looping: If statements, if-else statements, Nesting of if…else Statements, the Else if Ladder, The Switch Statements, The? : Operator, the Goto Statement, Break and Continue statements, the while Statement, The do Statement, the for Statement.

Arrays: Introduction, One dimensional array, Declaration of One dimensional arrays, Initialization of One dimensional arrays, two dimensional arrays, Initialization of two dimensional arrays.

Character Arrays and String: Introduction, Declaring and Initializing String Variables, Reading Sting from Terminal, Writing String to Screen, Comparison of two Strings, String-handling Functions, Table of Strings.

User-defined Function: Definition of Functions, Function Declaration, Category of Functions: No Arguments and No Return Values, Arguments but no return Values, Arguments with Return Values, No Arguments but Returns a Values, Recursion, Passing Arrays to Functions, Passing String to Function.

Structures and Union: Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Arrays of Structures, Arrays within Structure, Structure within Structure, Structures and Functions, union, Size of Structure.

Pointers: Introduction, Understanding Pointers, Accessing the Address of a Variable, Declaring Pointer Variables, Initialization of a Pointer Variable, Accessing a Variable trough its Pointer, Pointers and Arrays, Pointers and Character Strings, Array of Pointers, Pointers as Function Arguments, Function Returning Pointers, pointers to Function, Pointers to Structures.

File Management in C and Dynamic Memory Allocation: Introduction, Defining and Opening a File, Closing a File, Input/Output Operation on Files, Command Line Arguments, Dynamic Memory Allocation, Allocating a Block of Memory: Malloc, Allocating Multiple Blocks of Memory: Calloc.

Books Recommended:

1. E. Balagurushamy : Programming in ANSI C
2. Kernighan and Ritche : The C Programming Language
3. Herbert Schieldt : Turbo C/C++: The Complete Reference
5. Gotfried : Programming with C
6. Herbert Schieldt : The Complete Reference C

MATH – 112: Algebra, Trigonometry and Vector Analysis

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

1. a. Algebra of sets, DeMorgan's rule, relation and 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 and differentiation.

7. Vector differential operator-gradient. Divergence 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

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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 fuctions of one variable.
4.
    a. **Partial Differentiation :** Euler′s theorem, tangents and normals.
    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 and B.N. Mukherjee : Differential Calculus
3. B.C. Das and B.N. Mukherjee : Integral Calculus
4. Edwards : Differential Calculus

5. Williamson	:	Integral Calculus
6. K. Muhammad and P.K. Bhattacherjee	:	Differential Calculus
7. K. Muhammad and P.K. Bhattacherjee	:	Integral Calculus

STAT – R01: Elementary Statistics and Probability

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

1. **Statistics:** Meaning and Scope, Variables and 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 and Hall, London
2. Cramer H.	:	The Elements of Probability Theory, Wiley N. Y
3. Hoel. P. G.	:	Introductory Statistics, Wiley and 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 and 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 and Kendall M.G.	:	An Introduction to the Theory of Statistics; 4th ed. Charles Griffin, London.

APE –R102: Applied Electricity and Magnetism

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Network and Circuit Analysis: Kirchhoff's laws, Methods of analysis- Branch current, Mesh and Nodal analysis, T-Π and Π-T conversion, Superposition theorem, Thevenin's Theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem.

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, Transformers: Transformer action, Transformer construction, Equivalent circuit of Transformer, Different types of Transformer, Types of losses and efficiency of Transformer.

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.

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

Books Recommended:

1. B.L. Theraza : Electrical Technology
2. A.K. Haque, Rafiqullah and A.K. Roy : Concepts of Electricity and Magnetism
3. Bernard Grobe : Basic Electronics
4. R. Resnick and D. Halliday : Physics, part -II

5. Arthur Kip : Fundamentals of Electricity and Magnetism

ICE – 108: English

Lecture: 30 **50 Marks, 0.5 Unit, 0 Credits**

Exam Duration : 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

Functional English: Sentence- Review of parts of speech; Verb-Tense and its forms (conjugation); Articles; Punctuations; Basic structure-Simple; compound and complex sentences; Voice-Change of voice; Terminology of Physical quantities-their use in sentence; Statement and explanation of fundamental physical laws; Writing scientific English- report on experiments, report on a small project.

Books Recommended:

1. S.Ahmed : Learning English - The Easy Way.
2. AJ Thomson and A.V. Martinet : A Practical English Grammar
3. J. Swales : Writing Scientific English
4. Wren and martin : English Grammar and Composition
5. G.H. Vallins : Good English
6. A.S Hornby : The Teaching of Structural Words and Sentences Patterns (Stage 1& 2)
7. Hornby, AS : The Teaching of Structural Words and Sentences Patterns (Stage 3 & 4)

SECOND YEAR

ICE – 201: Analog Communication

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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

Modulation and Demodulation: Linear modulation - AM, SSB, DSB, and SSB generation, PLL Circuit to generate linear modulated signals, low and high power modulators, Exponential modulation- FM and PM, demodulation of AM, FM.

Broadcasting Transmitter: Transmitter classification, Elements of transmitter, AM and FM transmitters, SSB transmitter, stabilized master oscillator, Frequency multipliers, Mixer circuits, RF power amplifier, Pre-emphasis circuits, Transmitter performance-carrier frequency requirements, audio frequency response, distortion, signal to distortion ratio.

Radio Receiver: Receiver classification, Elements of receiver, AM and FM receivers, SSB receiver, Comparison of AM and FM receivers, Noise in receiver, AGC circuits, AFC circuits, Noise limiters, Receiver sensitivity, Cross modulation, Spurious responses.

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 Receiver: Fundamentals of TV receiver; picture tubes, Deflection circuit, High voltage power supply.

Books Recommended:

1. Kennedy & Davis	:	Electronic Communication Systems
2. Roddy & Coolen	:	Electronic Communications
3. G. K. Mathur		Radio Engineering
4. B. Grob	:	Basic TV
5. Gulati	:	Monochrome and Color TV
6. S.L. Gupta and Kumar	:	Electronics

ICE – 202: Electronics Circuit and Semiconductor Devices

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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.

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.

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's oscillator. Phase shift and Wein-bridge oscillators, Resonant circuit oscillators.

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.

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.

Books Recommended:

1. Allen Mottershead : Electronic Devices and Circuits
2. Millman and Halkias : Electronic devices and Circuits
3. Malvino : Electronic Principles
5. ‡gvt †gvRvddi †nv‡mb : B‡jK‡Uwb ·

ICE – 203: Electromagnetic Fields And Waves

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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.

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 lonosphere.

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.

Waveguides: Application of Maxwell's equations to the rectangular waveguides, The $TM_{m,n}$ wave in the rectangular waveguide, The $TE_{m,n}$ wave in the rectangular waveguide; Cylindrical waveguides.

Books Recommended:

1. S. Ramo, J.R. Whinnery and T.V. Duzer : Fields and Waves in Communication Electronics
2. J.D. Ryder : Networks, Lines and Fields
3. Corson and Lorain : Introduction to Electromagnetic Field and Wave.

ICE – 204: Data Structures and Algorithms

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction: Data types & data structures, data structure operations, Introduction to algorithms, performance 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 & searching a linked list, Doubly linked list & dynamic storage management, Generalized list, Garbage collection & 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: Sorting, Insertion sort, Shell sort, Heap sort, Radix sort.

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

Divide and conquer method: The general method, Merge sort, Quick sort, Selection sort, binary search.

Dynamic programming: The general method, multistage graphs, all pairs shortest paths, single source shortest paths problems.

Books Recommended:

1. E. Horowitz and S. Sahni : Fundamentals of Data Structures
2. E. Horowitz and S. Sahni : Computer Algorithm
3. S Lipschutz : Theory and Problems of Data Structures

4. Reingold : Data structures
5. T. H. Cormen, C. E. Leiserson : Introduction to Algorithms

ICE-205: Discrete Mathematics and Numerical Methods

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration : 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

Mathematical Logic: Connectives, normal Forms, theory of inference for proposition calculus, predicate calculus, inference theory of predicate calculus, methods of proof, mathematical induction.

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

Graphs and Trees: Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, problems, graph coloring, matrix representation of graph, Introduction to Tree, tree terminology.

Groups, Semigroups and Monoids: Definition of Groups and examples, Homomorphism, Product and Quotients of groups Homomorphism of semigroups and monoids, Grammars and languages, Formal definition of a language.

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:

1. Lipshutz : Theory and Problems of Discrete Mathematics,
2. B. Kolman R.C. Busby : Discrete Mathematical structures
3. Donals F. Stanat David S. Ross, F. McAllister : Discrete Mathematics in Computer Science.
4. S. S. Sastry : Introductory Methods of Numerical Analysis
5. A.R. Vasishtha, Vipin Vasishtha : Numerical Analysis

ICE-206: Signals & Systems

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration : 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

Introduction: Definition of Signals & Systems; Overview of Specific Systems, Classification of Signals, Basic Operation on Signals, Elementary Signals, Properties of Systems

Time Domain Representation of LTI System: Impulse Response (IR) representation of LTI system and its properties, Differential and Difference Equation representation of LTI systems, Block Diagram representations, State variable Descriptions for LTI systems.

Fourier Representation of Signals: DT Fourier Series, Fourier Series, DT Fourier Transform, Fourier Transform, Properties of Fourier representation.

Applications of Fourier Representation: Frequency response of LTI systems, FT representation for periodic signals, Convolution and Modulation with mixed signal classes, FT representation for DT signals, Sampling, Reconstruction of Continuous Time signals from samples, DT processing of CT signals, FS representations for Finite Duration non periodic signal.

Laplace Transform: Laplace Transform (LT), Unilateral LT, Inversion of LT, Solving differential equations with initial conditions, Bilateral LT, Transform analysis of systems.

z-Transform: z-Transform, Properties of RoC, Properties of z-Transform, Inversion of z-Transform, Transform analysis of LTI system, Computational Structures for implementing DT systems, unilateral z-Transform.

Books Recommended:

1. Simon Haykin & Barry Van Veen : Signals & Systems
2. J G Proakis & D G Manolakis : Digital Signal Processing
3. A J Thompson : Digital Signal Processing

MATH - 214: Matrices and Differential Equations

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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.

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.

Books 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
7. L.Pipes : Applied Mathematics for Engineers and Physicist
8. I.S. Sokolniko F.F. and R.M. Redheffer : Mathematics for Physics and Modern Physics

STAT – 209: Theory of Statistics

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Sampling Distribution: Fisher's Lemma, Study of χ^2-Distribution, T-Distribution and F-Distribution, Properties, uses and 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 and 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 and 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 2×2 tables, Test for r×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.
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 Graig. A.T. : Introduction to Mathematical Statistics fourth Ed, collier Macmilan, N, LY.
6. Kendall M.G. and Stuart A. : The advanced Theory of Statistics Vol, 1, Fourth Ed, Charles, Griffin and Co. London
7. Lindgren, B.W. : Statistical Theory, Third Ed. Collier-Macmillan Co.
8. Mood, Graybill and Boes : Introduction to the Theory of Statistics, third Ed. McGaraw-Hill, N.Y.
9. Weatheril, G.B. : Intermediate Statistics Methods, Chapman and Hall, London.

THIRD YEAR

ICE – 301: Microwave Communication and Radar

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Microwave Components and Devices: Klystron, Magnetron, TWT, Maser, Circuit theory for wave guide system, T-Junction, Magic-T, Hybrid-T, cavity, Excitation of wave guide, Probe and aperture coupling, Directional coupler, Planer microwave components.

Microwave Measurement Techniques: Microwave components and measuring instruments, Five basic microwave measurement: Power, Transmission, Impedance, Frequency and Noise, Measurement based on transmission and reflection, Radiation pattern measurements, Antenna range design and evaluation, frequency response test set, TDR systems.

Microwave Link: Microwave link and its advantage, Frequency assignment and modulation methods, Transmitting and receiving equipment, Base band repeater, IF repeater, Microwave carrier supply, Microwave antenna, 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, Lens and parabolic antenna for radar and navigation.

Books Recommended:

1.D M Pozar	:	Microwave Engineering
2. Thomas G Lavevghetta	:	Microwave Measurements and Technique
3. D. Roddy and Coolen	:	Electrical Communication.
4. M. I. Skolnik	:	Introduction to Radar System.
5. Kennedy and Davis	:	Electronics Communication System.
6. J.C. Hancock	:	An Introduction to the Communication Principles and Communication Theory.

ICE – 302: Telecommunication Systems, Networks and Switching

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction of Switching System: Basic switching system, Transmission bridge, Types of switching system, Basic switching center model, Resource sharing, Signaling technique, Data and message switching systems, switching elements..

Design of Switching Network: Fundamental subdivision, Common switching networks and their control, Control of switching system, Multi-stage networks, Use of mixing stages, Network and Channel graphs, Network with concentration.

Control Unit Design: Role of control units, The arbiter, State transition diagram, Signaling between control units, signaling techniques, Design of control unit for two way traffic.

Traffic Engineering: Network traffic load and parameters, Grade of service and blocking probability, Modeling switching systems, Incoming traffic and service time characterization, Blocking models and loss estimates, Delay systems.

Practical Switching System: Introduction, Step-by-step switching, Design parameters, 100-line switching system, 1000-line switching system Crossbar switching configuration, Reed relay systems, Computer controlled switching system, Software organization of computer controlled centers. No. 1 ESS, Japanese D-10, Metaconta systems.

Books Recommended:

1. M. T. Hills : Telecommunication Switching Principle.
2. Thiagrajan Viswanathan : Telecommunication Switching Systems And Networks.
3. J.C. Bellamy : Digital Telephony.

ICE – 303: Digital Communication

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction: Sources and signals, Basic signal processing operation in digital communication, Channels for digital communication, Channel capacity theorem, Channel coding theorem.

Detection and Estimation: Model of digital communication system, Gram-Schmidt orthogonalization procedure, Geometric interpretation of signal, Detection of signals in noise, Probability of error, correlation receiver, matched filter receiver, Estimation: concept and criteria, Maximum Likelihood Estimation, Weiner filters, adaptive filters, Linear prediction.

Sampling Process: Sampling theorem, Quadrature sampling of band-pass signals, Reconstruction of a message process from its samples, Signal distortion in sampling.

Waveform Coding Techniques: PAM, PCM, Channel noise, Quantization noise, SNR, Robust quantization.

Baseband Shaping for Data Transmission: Power spectra of discrete PAM signals, Inter-symbol interference, Nyquist criterion, Correlation coding, Eye pattern, Baseband M-ary PAM systems, Adaptive equalization for data transmission.

Digital Modulation Techniques: Digital modulation formats, coherent and noncoherent binary modulation techniques, Coherent quadrature modulation techniques, Spread spectrum modulation: DS and FH spread spectrum techniques, M-ary modulation techniques, Power spectra, Bandwidth efficiency, Effect of inter-symbol interference, Bit versus symbol error probabilities, Synchronization.

Error Control Coding: Rationale for coding and types of codes, discrete memory-less channels, Linear block codes, Cyclic codes, Maximum likelihood decoding of convolution codes, Distance properties of convolution codes, Trellis codes.

Books Recommended:

1. S Haykin : Digital Communication Systems
2. J G Proakis : Digital Communication
3. J G Proakis & Salehi : Communication Systems

ICE – 304: Digital Signal Processing

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Efficient Computation of DFT: FFT Algorithms, Applications of FFT Algorithms, Linear filtering approach to computation of DFT, Quantization effect on computation of DFT.

Digital Filters: Causality, symmetric and asymmetric FIR filter, Linear-phase FIR filter, FIR differentiator, Hilbert transformer, IIR Filter design, matched z-transformation, frequency transformations, Digital filter design by LS method.

Multirate Signal Processing: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion (SRC), Filter design for SRC, Multistage implementation of SRC, SRC of band pass signal, SRC by arbitrary factor, Multirate signal processing applications.

Optimum Filters and Spectrum Estimation: FIR Wiener Filter, IIR Wiener Filter, Discrete Kalman Filter, Nonparametric Methods, Parametric Methods, Frequency Estimation.

Adaptive Filtering: Introduction, FIR Adaptive Filters, Adaptive Recursive Filters, Recursive Least Squares.

Books Recommended:

1. J G Proakis & D G Manolakis : Digital Signal Processing- Principles and Application

2. M H Hayes : Statistical Digital Signal Processing

3. Oppenheim and Schaffer : Digital Signal Processing

ICE – 305: Network Programming with JAVA

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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, Java application and Applet, Variables, Data Types, Arrays, Operators and Control Flow:

Methods: Using methods, Declaring a class method, Implementation of Inheritance, Calling a class method, Passing parameters, Local variables and variable scope.

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.

Thread: Thread, Multithread, Synchronization, Deadlock, Thread Scheduling.

Socket Programming: Socket Basics, Socket-based Network Concepts, Client Server Basics, Client Server Algorithm, Socket for Client, Socket for Server.

Java Database Connectivity: JDBC, JDBC drivers, the JAVA.sql packages, SQL, JDBC connection and Executing SQL, The process of building a JAVA application.

Advanced Java Programming: Java Servlets and Servlets Architectures, RMI, Multimedia, Java Bens, Java Server Pages.

Books Recommended:

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

3. H.M. Deitel and P.J. Deitle : Java: How to Program

ICE – 306: Digital Image Processing

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration : 3 Hours

There should be 5 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

Color Models: 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.

Digital Image Fundamentals: Digital Image Processing, Image Representation and Modeling, Image Sampling and Quantization, Image Transformation, Image Representation.

Image Enhancement: Point Operation, Gray Level Transformation, Histogram Modeling, Spatial Operations, Transform Operations, Multispectral Image Enhancement, False Color and Pseudocolor, Color Image Enhancement.

Image Restoration: Image Observation Models, Inverse and Wiener Filtering, FIR Wiener Filters, Restoration in presence of Noise, Periodic Noise Reduction by Frequency Domain Filtering.

Image Segmentation and Compression: Spatial feature extraction, Image Segmentation, Edge Detection, Boundary Extraction, Region Representation, The Radon Transformation, Pixel coding for image data compression, predictive techniques, Transform coding, Hybrid Coding.

Books Recommended:

1. Anil K. Jain : Fundamentals of Digital Image Processing

2. Rafael C. Gonzalez : Digital Image Processing

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

ICE – 307: Satellite and Optical Fiber Communications

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Satellite Communication Systems: Introduction, Kepler's first, second and third law, Orbits, Geostationary and Geosynchronous orbit, Power System, Altitude Control, Satellite station keeping, Antenna look angles, Limits of visibility, Frequency plans and polarization, Transponders, Uplink and downlink power budget, Overall link budget, digital carrier transmission, Multiple Access methods

Optical Communication System: The general system, Advantages of optical fiber communication materials, Types of fibers, Ray theory transmission, Light propagation principle in optical fiber, Electromagnetic mode theory for optical propagation, cylindrical fiber, Single mode fiber, Multimode fiber, Transmission characteristics of optical fibers-Attenuation, Dispersion.

Fiber Optic Technology: Preparation of optical fibers, Optical fiber cables, Fiber splices, Fiber connectors, Fiber couplers.

Optical Communication Equipments: Optical Sources- LED, Laser (Principles, Technology, Parameters, Characteristics and modulation); Optical Detectors-PIN, Schottky diode (Principles, Technology, Parameters, Characteristics and noise consideration); Direct detection receiver performance considerations, Optical amplification and integrated optics.

Optical Fiber measurements: Fiber attenuation measurements, Fiber dispersion measurements, Fiber refractive index profile measurements, Fiber diameter measurements.

Applications and Future developments: Public network applications, Millitary applications, Civil, consumer and industrial applications, Optical sensor systems, Computer applications, Local area networks.

Books Recommended:

1. D. Roddy and Coolen : Electrical Communication.
2. Carter : Communication Satellite
3. J.M.Senior : Optical Fiber Communication
4. Barnoski : Fundamental of Optical Fiber Communication

ICE – 308: Antenna Engineering

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration : 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

Antennas: Introduction, Wire Antennas; Aperature, Microstrip, Array, Reflector and Lens Antennas; Radiation mechanism; Current distribution on a thin wire antenna.

Fundamental Parameters of Antenna: Radiation patterns, Radiation power density, Radiation intensity, Directivity, Gain, Antenna efficiency, Half-power beamwidth, Beam efficiency, Bandwidth, Polarization, Input impedance, Antenna radiation efficiency, Vector effective length, Maximum directivity and maximum effective area, Antenna temperature,

Linear Wire Antennas: Introduction, Infinitesimal dipole, Small dipole, Region separation: Far-field and near-field, Finite length dipole, Half wavelength dipole, Linear elements near infinite perfect conductor, Ground Effects.

Loop Antennas: Introduction, Small circular loop, circular loop of constant current, circular loop with nonuniform current, Ground and earth curvature effect, Ferrite loop, Mobile communication system Applications

Antenna Arrays: Two element array, N-element linear array: Uniform amplitude and spacing, Directivity, 3D characteristics, Uniform spacing and nonuniform amplitude; Superconductivity, Planar array.

Antenna measurements: Antenna Ranges, Radiation patterns, Gain and directivity measurements; Radiation efficiency; Impedance, current and polarization measurements; Scale model measurements.

Books Recommended:

1. C A Balanis : Antenna Theory

2. J D Kraus : Antennas

FOURTH YEAR

ICE – 401: Computer Networks and Communications

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours
There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction: Computer networks, Types of Computer networks, Network Topology, Circuit Switching and Packet Switching, protocol and protocol hierarchies, The OSI reference model, TCP/IP protocol suit.

Physical Layer: The theoretical basis for data communication, Transmission media: wired and wireless, Narrowband ISDN, Broadband ISDN and ATM

Data link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, sliding window protocols, Protocol specification and verification, HDLC. **Medium Access Sublayer:** Channel allocation problem, multiple access protocols, IEEE standards for LANs and MANs, Bridges, and High Speed LANs, ATM and Frame Relay

Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Internetworking, IP, IP addresses, Network layer protocols; ARP, IP_v4, ICMP, IP_v6, Routing protocols; OSPF and BGP.

Transport layer: Process-to-process delivery, User Datagram Protocol(UDP), Transmission Control Protocol(TCP), Congestion control and Quality of service, Performance issues.

Application Layer: Client-Server Model, Domain Name System(DNS), Electronic mail(SMTP) and File Transfer(FTP), HTTP and WWW

Books Recommended:

1. A. S. Tanenbaum : Computer Networks
2. B. Forouzan : Data Communication Networking.

ICE – 402: Computer Architecture and Organization

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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

Processor basics: CPU organization, information and number formats, instruction set, instruction format and instruction types, addressing modes.

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: Basic concepts, Front size Bus (FSB), Bus control, Arbitration, I/O interface circuit, Programmed I/O, DMA and Interrupts, I/O processors.

Pipelining and Vector Processing: Parallel processing, Pipelining, Arithmetic Pipelining Instruction Pipeline, Vector Processing, Vector Operations, Matrix multiplication, Array Processors.

Microprocessors: Evolution of microprocessors, microprocessor organization, 8085 and 8086 microprocessors, microprocessor applications, series of Intel and Pentium microprocessors.

Books Recommended:

1. John P. Hayes : Computer Architecture and Organization

2. Barry B. Brey : Microprocessor Hardware Interfacing and Application

3. Morris Manno : Digital Logic and Computer Design

4. P. Pal Choudhury : Computer Organization and Design.

5.M. Morris Manno : Computer System and Architecture

ICE – 403: Database Management Techniques

Lecture: 30 **50 Marks, 0.5 Unit, 2 Credits**

Exam Duration : 3 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 10 marks each.

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

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

File Organization: Sequential file organization, Index file 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 and performance, multiple file database general considerations, designing the files, data entry and consistency, data updating, tools for complex database manipulations.

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

Books Recommended:

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. Korth and S.Sudarshan : Database System Concepts.

ICE – 404: Wireless Communication

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction: History, Wireless vision, Technical issues, Current wireless Systems, Wireless spectrum, Standards.

Path loss & Shadowing: Radio wave propagation, Transmit and receive signal models, Free space path loss model, Ray tracing and empirical path loss models, Simplified path loss model, Shadow fading, Combined path loss and shadowing, Outage probability, Cell coverage area.

Cellular System Design: Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking & GoS, Capacity and coverage improvement.

Statistical Multipath Channel: Time varying Channel impulse response, Narrow band fading model, Wideband fading models, Discrete time model. Space-time channel model.

Digital Modulation Performance: SNR and bit/symbol energy, Error probability in AWGN channel for BPSK, QPSK, MPSK, MQAM, FSK, CPFSK and differential modulation; Alternate Q-function; Performance in fading channel, outage probability, Average probability of error, Combined outage and average error probability, Doppler spread, ISI.

Diversity & Equalization: Receiver diversity system model, Selection combining, Threshold combining, MRC, EGC, Transmit diversity, Alamouti Scheme. Diversity analysis, Equalizer noise enhancement; Equalizer types; ISI free Transmission; ZF and MMSE Equalizer; MLSE, Decision feed back equalizer; Training and tracking for Adaptive equalization.

Spread Spectrum: SS principle, DSSS system model, spreading codes, system model, spreading codes, synchronization, RSKE receiver, FHSS, Spreading code for Multi-user DSSS, DL & UL channel, Multi-user detection, MC-CDMA, Multiuse FHSS.

Multi carrier modulation: Data transmission using multi carrier, MCM with overlapping sub channel, Sub carrier fading mitigation, Cyclic Prefix, OFDM, Matrix reorientation of OFDM, MIMO-OFDM, MC-CDMA.

Books Recommended:

1.A J Goldsmith : Wireless Communication

2. T S Rappaport : Wireless Communication: Principles and Practices

3. A Molisch : Wireless Communication

ICE-405: Information Theory and Coding **1 Unit, 100 Marks, 4 Credit**

Lecture: 60

Exam Duration: 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Entropy, Relative Entropy, and Mutual Information: Entropy; Joint Entropy and Conditional Entropy; Relative Entropy and Mutual Information; Relationship between Entropy and Mutual Information; Chain Rules for Entropy; Relative Entropy and Mutual Information; Jensen's Inequality and Its Consequences; Log Sum Inequality and Its Applications; Data-Processing Inequality; Sufficient Statistics; Fano's Inequality

Asymptotic Equipartition Property: Asymptotic Equipartition Property Theorem; Consequences of the AEP: Data Compression; High-Probability Sets and the Typical Set

Entropy Rates of a Stochastic Process: Markov Chains; Entropy Rate; Entropy Rate of a Random Walk on a Weighted Graph; Functions of Markov Chains

Source Coding and Data Compression: Kraft Inequality; McMillan's Theorem; Optimal Codes; Bounds on the Optimal Code Length; Kraft Inequality for Uniquely Decodable Codes; Huffman Codes; Shannon–Fano–Elias Coding; Universal Codes and Channel Capacity, Run-Length Coding; Arithmetic Coding, Higher-Order Modeling, The Lempel-Ziv Algorithm.

Channel Capacity: Noiseless Binary Channel; Noisy Channel with Nonoverlapping Outputs; Binary Symmetric Channel; Binary Erasure Channel; Symmetric Channels; Properties of Channel Capacity; Preview of the Channel Coding Theorem; Jointly Typical Sequences; Channel Coding Theorem; Zero-Error Codes; Fano's Inequality and the Converse to the Coding Theorem; Equality in the Converse to the Channel Coding Theorem; Hamming Codes; Feedback Capacity; Source–Channel Separation Theorem

Books Recommended:

1. Elements of Information Theory : TM Gover, JM Thomos
2. Fundamentals of Information Theory and Coding Design : Roberto Togneri and Christopher J.S. deSilva

ICE – 406: Artificial Intelligence and Neural Computing

Lecture: 60 **100 Marks, 1 Unit, 4 Credits**

Exam Duration : 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

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

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.

Reasoning and Problem Solving: Derivation of consequences from facts, Different characterizations 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, Connection of logic with programming, Forward and backward chaining, Resolution.

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.

Overview of AI Programming Language: Prolog, Visual Prolog, LISP etc.

Books Recommended:

1. S. Russel and P. Norving — Artificial Intelligence A Modern Approach
2. E. Ritch and K. Knight — Artificial Intelligence
4. Generserth, Michael R, and Nilsson Nills : Logical Fundamentals of AI.
5. Ivan Bratko : Prolog Programming for AI.
6. Simon Haykin — Neural Networks A Comprehensive Foundation

ICE-407: Cryptography and Network Security **1 Unit, 100 Marks, 4 Credit**

Lecture: 60

Exam Duration: 4 Hours

There should be 8 questions in all. Student may be asked to attempt 5 questions out of 8 questions of 20 marks each.

Introduction: Overview of the various cryptographic services, Mechanisms and attacks, The OSI security architecture, Model for Network Security, Foundation of Cryptography: Cipher and Secret Messages, Security Attacks and Services.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques – Caesar cipher, Monoalphabetic ciphers, Playfair cipher, Hill cipher, Polyalphabetic cipher, One-time pad, Transposition Techniques, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic.

Symmetric Ciphers: DES and the Strength of DES, Theory of Block Cipher Design, Block Cipher Modes of Operation, The AES Cipher, Contemporary symmetric ciphers, Random Number Generation.

Public-Key Encryption: Prime Numbers and Testing for Primality, Discrete Logarithms, Principles of Public-Key Cryptosystems, the RSA Algorithm, Key Management, Diffie-Hellman Key Exchange.

Hashes and Messages Digests: Message Authentication, Hash Functions, Security of Hash Functions and MACs, MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

Digital Signatures and Authentication: Digital Signature, Authentication Protocols, Digital Signature Standard, Authentication of Systems: Kerberos, X.509 Authentication Service.

Electronic Mail Security: Pretty Good Privacy (PGP), Secure/Multipurpose Internet Mail Extension (S/MIME).

IP and Web Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security.

System Security: Intruders, Intrusion Detection, Password Management, Viruses and Related Threats, Virus Countermeasures, Firewall Design Principles, Trusted Systems.

Books Recommended:

1. William Stallings : Cryptography and Network Security: Principles and Practice
2. Bruce Schneier : Applied Cryptography
3. C P. Pfleeger & S L Pfleeger : Security in Computing Protocols, Algorithms, and Source code in C