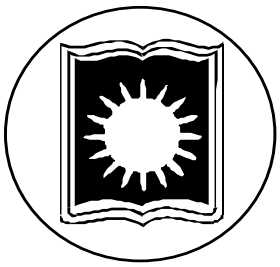
University of Rajshahi

Department of Information and Communication Engineering

Faculty of Engineering

Syllabus for B.Sc. Engineering

Session: 2014-2015



Examination

1st Year - 2015

2nd Year -2016

3rd Year - 2017

4th Year – 2018

The B.Sc. Engineering courses in Information and Communication Engineering shall be offered over a period of four academic years, each of a normal duration of one calendar year. The four academic years shall be designated as Part-I, Part-II, Part-III and Part-IV in succeeding higher levels of study. The academic year will be divided into two semesters (Odd and Even) each having a duration of 19 weeks. Under no circumstances, any student shall be allowed to continue his/her study for B.Sc. Engineering degree for more than six academic years. A student will be required to have 70% attendance of the total number of periods of lectures/tutorials/laboratory classes held during the semester in every course to appear as a regular candidate at that semester final examinations. The Courses offered for Information and Communication Engineering department will consist of theoretical, practical, viva-voce, quizzes/class tests, attendance, and research project and are of 4000 marks (40 units, 160 credits). The 4 credits, 3 credits and 2 credits courses carry 100 marks, 75 marks and 50 marks, respectively.

Degree Requirements

A student must successfully complete the courses of all the semesters (within maximum six academic years for irregular students) to be eligible for the award of B.Sc. Engineering degree in Information and Communication Engineering. The minimum passing grade in a theoretical course will be D and the minimum passing grade in a laboratory/project/field course (henceforth referred to as laboratory course) and viva-voce will be **C.** In order to qualify for the B.Sc. Engineering degree, a student must have to earn minimum 150 credits and a minimum Cumulative Grade Point Average (CGPA) of 2.25.

Conducting Examinations and Rules for Promotion

I. The academic year shall be divided into two semesters each having duration of not less than 11 teaching weeks.

II. There shall be final examinations conducted by the concerned Examination Committee of the Departments at the end of each semester.

III. The results shall be finalized at the end of the even semester of the academic year. A student entering in an odd semester **shall automatically move** on to the next semester, unless he/she was **barred** from appearing at the final examinations at the end of the semester. Individual **course** grades and **GPA** shall be announced within a date ordinarily no later than three weeks after the end of the semester final examinations.

IV. **Minimum passing grade:** The minimum passing grade in a theoretical course will be D and the minimum passing grade in a laboratory/project/field work/in-plant training/workshop/similar Courses (henceforth referred to as laboratory course) and **Viva voce** will **be C.**

V. **Promotion to higher class:** In order to be promoted to higher class a student must obtain following requirements:

   a. Yearly Grade Point Average (YGPA) of 2.25 or higher
   b. Credit point loss (F or I Grade) in theoretical courses not more than 10.
   c. Minimum C Grade in the Laboratory course and viva-voce.

VI. **Course Improvement:** A promoted student may appear for course improvement in the immediate next academic year for maximum 10 credit points to clear his/her F grade or to improve the grades on the courses in which less than B grade (including those of F grade) was obtained in Part-I, Part-II and Part-III examinations. In such case, the student has to give his/her choice of course/courses for course improvement in writing. If the student fails to clear his/her F grades in the first attempt, he/she shall get another (last) chance in the immediate next year to clear the F grades**.** In the case of student's failure to improve his/her course grade at the course improvement examination, the previous grade shall remain valid.

VII. **Course Exemption:** Students who fail to be promoted to the next higher class shall be exempted from taking the theoretical and laboratory courses where they obtained grades **equal to B or above.** These grades would be counted in calculating GPA in the next year's examination results.

Readmission and Course Exemption: If a student fails to obtain the degree within 4 or 5 academic year, he/she will be readmitted in Part-IV and will appear for the exam according to the clause VI (Course Improvement). Course exemption rules will also be valid according to clause VII (Course Exemption).

Grading System

The letter grade system for assessing the performance of the students shall be as follows:

Marks	Letter Grade (LG)	Grade Point (GP)
80% or above	A+	4.0
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.5
65 to less than 70%	B+	3.25
60% to less than 65%	B	3.0
55% to less than 60%	B-	2.75
50 to less than 55%	C+	2.5
45% to less than 50%	C	2.25
40 to less than 45%	D	2.0
less than 40%	F	0.0
Incomplete	I	0.0

A letter grade 'I' (incomplete) shall be awarded for courses in the odd semester which continue through to the even semester.

Calculation of Grade Point Average (GPA), Yearly Grade Point Average (YGPA) and Cumulative Grade Point Average (CGPA)

A **Grade Point Average (GPA**) shall be calculated for each semester as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

Where, n is the number of courses offered during the semester, C_i, is the number of credits allotted to a particular course and G_i is the grade point earned for that course.

A **Yearly Grade Point Average (YGPA**) shall be calculated for each academic year as follows:

$$YGPA = \frac{\sum_{j=1}^{2} C_j G_j}{\sum_{j=1}^{n} C_j}$$

Where, 2 signifies that there are two (2) semesters in a particular year, C_j is the number of credits allotted to a semester and G_j is the GPA earned for that semester.

The **Cumulative Grade Point Average** (CGPA) gives the cumulative performance of the students from the 1st year up to the end of the year to which it refers, and will be calculated as follows:

$$CGPA = \frac{\sum_{k=1}^{m} G_k C_k}{\sum_{k=1}^{m} C_k}$$

Where, m is the total number of years being considered, C_k is the total number of credits registered during a year and G_k is the YGPA of that particular year.
A Cumulative Grade Point Average (CGPA) shall be calculated at the end of each academic year and to be communicated to the students along with the YGPAs. The individual grades of courses obtained by them for the semesters of the academic years will, however, be communicated at the end of individual semester by the Chairman of the Examination Committee.

Publication of Results

In order to qualify for the B.Sc. Engg. degree, a student must have to **earn minimum 150 credits and a minimum CGPA of 2.25 within a maximum of six academic years**. The result will be published in accordance with merit. Candidates for Bachelor degree in engineering will be awarded the degree with Honors if their earned credit is 160 and **CGPA is 3.75 or higher.** As a recognition of excellent performance, the names of students obtaining a cumulative GPA of 3.75 or above in two regular semesters in each academic year may be published in the Dean's List in the faculty. Students who have received **'F' grade** in any course during any of the two regular semesters will not be considered for Dean's List in that year.

Merit Position

The YGPA obtained by a student in the **semester final examinations** will be considered for determining the **merit position for the award of scholarships, stipends etc.**

Result Improvement

A candidate obtaining B.Sc. Engg. within 4 or 5 academic years shall be allowed to improve his/her result, of maximum of 10 credit points (courses less than 'B' grade) of the Part-IV theoretical courses in the immediate next regular examination after publication of his/her result. No improvement shall be allowed for laboratory examinations and Board Viva-voce. If a candidate fails to improve CGPA with the block of new GP in total, the previous results shall remain valid.

Syllabus

Courses offered to the undergraduate students of the Department of Information and Communication Engineering (ICE)

Overall Marks and Credits distribution for B.Sc. Engg. (ICE)

Course Type		Marks	Marks (%)	Credits
Humanities		200	5	8
Basic Science		600	15	24
Basic and Major Engineering		3200	80	128
Distribution	(i) Basic Engineering	125	3.125	5
	(ii) Major Engineering			
	(a) Theoretical	1925	48.125	77
	(b) Laboratory	950	23.750	38
	(c) Viva-Voce	200	5	8
Total		**4000**	**100**	**160**

Summary of Courses

Part – I Exam-2015 (Odd Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
CSE1151	Introduction to Computer Engineering	50	2	2	3
ICE1111	Digital Electronics	100	4	4	6
APEE1121	Electronics Fundamentals	50	2	2	3
ICE1122	Electronics Lab-I	100	4	8	12
MATH1111	Algebra, Trigonometry and Vector Analysis	75	3	3	5
CHEM1111	Physical and Inorganic Chemistry	75	3	3	5
ENG1111	Technical and Communicative English	50	2	2	3
		500	**20**	**24**	**37**

Part – I Exam-2015 (Even Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE1211	Computer Programming	50	2	2	3
ICE1212	Computer Programming lab	50	2	4	6
ICE1221	Basic Electronics	50	2	2	3
ICE1222	Electronics Lab-II	50	2	4	6
MATH1211	Differential and Integral Calculus	75	3	3	5
STAT1211	Statistics for Engineers	50	2	2	3
PHY1221	Applied Electricity and Magnetism	75	3	3	5
ECON1211	Economics	50	2	2	3
ICE1210	Viva-Voice	50	2	-	-
		500	**20**	**22**	**34**

Part – II Exam-2016 (Odd Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE2111	Electronic Circuits and Semiconductor Devices	100	4	4	6
ICE2112	Electronic Circuits Lab	50	2	4	6
ICE2121	Analog Communication	75	3	3	4
ICE2131	Signals and Systems	50	2	2	3
ICE2132	Signals and Systems Lab	50	2	4	6
MATH2111	Matrices and Differential Equations	75	3	3	5
STAT2111	Basic Theory of Statistics	50	2	2	3
ACCO2111	Industrial Management and Accountancy	50	2	2	3
		500	**20**	**24**	**36**

Part – II Exam-2016 (Even Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE2211	Electromagnetic Fields and Waves	75	3	3	4
ICE2221	Cellular and Mobile Communication	75	3	3	4
ICE2222	Communication Lab	50	2	4	6
CSE2261	Introductory Data Structures	75	3	3	4
ICE2262	Data Structure Lab	50	2	4	6
MATH2221	Discrete Math and Numerical methods	75	3	3	5
SOCI2211	Sociology	50	2	2	3
ICE2210	Viva-Voce	50	2	-	-
		500	**20**	**22**	**32**

Part – III Exam-2017 (Odd Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE3111	Microwave Communication and Radar	100	4	4	6
ICE3121	Digital Signal Processing	100	4	4	6
ICE3122	Digital Signal Processing Lab	50	2	4	6
ICE3131	Digital Image Processing	50	2	2	3
ICE3132	Digital Image Processing Lab	50	2	4	6
ICE3141	Antenna Engineering	50	2	2	3
ICE3142	Antenna Engineering Lab	50	2	4	6
ICE3151	Satellite Communication	50	2	2	3
		500	**20**	**26**	**39**

Part – III Exam-2017 (Even Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE3211	Java and Network Programming	100	4	4	6
ICE3212	Java and Network Programming Lab	50	2	4	6
ICE3221	Digital Communication	100	4	4	6
ICE3222	Digital Communication Lab	25	1	2	3
ICE3231	Telecommunication System, Networks and Switching	100	4	4	6
ICE3241	Optical Fiber Communication	50	2	2	3
ICE3242	Optical Fiber Communication Lab	25	1	2	3
ICE3210	Viva-Voce	50	2	-	-
		500	**20**	**22**	**33**

Part – IV Exam-2018 (Odd Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE4111	Artificial Intelligence and Neural Computing	75	3	3	4
ICE4112	Artificial Intelligence Lab	25	1	2	3
ICE4121	Computer Architecture and Organization	75	3	3	4
ICE4122	Microprocessor Lab	25	1	2	3
ICE4131	Wireless Communication	100	4	4	6
ICE4132	Wireless Communication Lab	50	2	4	6
ICE4141	Database Management System	50	2	2	3
ICE4142	Database Management System Lab	50	2	4	6
ICE4151	Information System Analysis and Design	50	2	2	3
		500	**20**	**26**	**38**

Part – IV Exam-2018 (Even Semester)

Course Code	Course Titles	Marks	Credits	Contact Hours/week	Contact Period/week
ICE4211	Computer Networks	100	4	4	6
ICE4212	Computer Networks Lab	50	2	4	6
ICE4221	Fundamentals of Cryptography	100	4	4	6
ICE4222	Cryptography Lab	50	2	4	6
ICE4231	Information Theory and Coding	100	4	4	6
ICE4210	Viva-Voce	50	2	-	-
ICE4242	Research Project	50	2	-	-
		500	**20**	**20**	**30**

Detail Syllabus

Part-I (Odd Semester)

CSE1151: Introduction to Computer Engineering

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33 Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

Section-B

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.

Recommended Books:

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

ICE1111: Digital Electronics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Number System: Binary numbers, Number base conversion, Octal and Hexadecimal numbers, Complements, Binary code, Binary storage, Digital Logic.

Boolean Algebra and Logic Gates: Basic definitions, Axiomatic definitions of Boolean algebra, Basic theorem and properties, Boolean functions, DeMorgan Theorem, Canonical and standard forms, 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.

Section-B

Combinational Logic: Design Procedure, Adders, Subtractors, Boolean Code conversion, 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.

Recommended Books:

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

APEE1121: Electronics Fundamentals

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

1. **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.
2. **Semiconductor Diodes:** n-and p-type semiconductors, p-n junction diodes and their volt-ampere characteristics, rectifier diode, zener diode, Varactor diode and their V-I characteristics.

Section-B

3. **Diode Applications:** Load line analysis and concept of rectifier, half-wave rectifier, full-wave rectifier, Voltage regulator using zener diode, clippers, clampers and voltage multiplier circuit.
4. **Bipolar Transistor:** Transistor construction and operation, CE, CB and CC configurations and their I/O characteristics, transistor amplifying action, operating point, load line, stabilization, biasing, hybrid equivalent model.

Recommended Books:

1. R L Boylestad Introductory Circuit Analysis

2. R L Boylestad Electronic Devices and Circuits Theory

3. Millman and Halkias Electronic Devices and Circuits

5. Gupta & Kumar Handbook of Electronics
6. A. P. Malvino Principle of Electronics

MATH1111: Algebra, Trigonometry and Vector Analysis

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

1. Algebra of sets, De Morgan's rule, relation & function. Determinants: Properties and Cramer's rule.
2. Theory of Equations: Theorem, and relation between roots and coefficients. Solution of cubic equations.
3. De Moiver' theorem. Deduction from De Moiver's theorem.

Section-B

1. Functions of complex arguments. Gregory's series. Summation of series. Hyperbolic functions.
2. Vector Addition, Multiplication & Differentiation.
3. Definitions of line, surface and volume integral. Gradient of scalar function, Divergence and curl of vector function. Physical significance of gradient, divergence and curl. Integral forms of gradient, divergence and curl, Divergence Theorem, Stoke's theorem, Green's theorem and Gauss's theorem.

Recommended Books:

Text Books:
1. **H. S. Hall and S. R. Knight**: *Higher Algebra*.
2. **B. C. Das and B. N. Mukherjee**: *Higher Trigonometry*.
3. **M. R. Spiezel**: *Vector Analysis*.

Reference Books:
1. **Barnside and Panton**: *Theory of Equations*.
2. **Barnside and Child**: *Higher Algebra*.
3. **M. A. Sattar**: *Higher Trigonometry*.
4. **M. A. Sattar**: *Vector Analysis.*

CHEM1111: Physical and Inorganic Chemistry

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

1 **Electrochemistry (10 Lectures):**Conductors, Electrolytes and Electrolysis; Faradays Laws of Electrolysis and their significance. Ohm's law and electrolytic conductances; Theories for electrolytic conductance (Arrhenius & Debye-Hükel). Ionic mobility, Kohlrausch's law, Transference Number and its determination; Activities, activity coefficient and Debye-Hükel limiting law. Electrochemical cells (Electrolytic and Galvanic/Voltaic): Electrode reaction and potentials. Reference electrodes; Reversible and concentration cells , Storage Batteries(or accumulators).

2 **Chemical Equilibrium and Kinetics (10 lectures):** Equilibrium and Equilibrium constants, Kc, Kp, Kx. Rate of reaction and rate constants; Le Chatelier principle and its application. Order and molecularity of a reaction; integrated rate expressions & half- lives of zeroeth, first and second order reactions. Determination of order & temperature dependence of a reaction; energy of activation and Arrhenius equation. Transition-state theory of reaction rates. Characteristics of catalysis, promoters and inhibitors.

3 **Surface Chemistry and Colloids (10 lectures):** Adsorption and sorption; Characteristics of physical and chemical adsorptions. Fruendlich, Langmuir and Gibb's Adsorption isotherms; The BET equation. Crystalloids, Colloids and their classification, preparation, properties (kinetic, colligative, optical & electrical) and importance, Original pf charge and stability of colloids (sols), Gold number; colloidal electrolytes. Elementary idea about emulsions and gels.

Section-B

4 **Atomic structure and Periodic Table (10 lectures):** Modern concept of atomic structure and Periodic Table; related principles and Laws. Constitution and Periodic properties of elements (ionization potential, electronigativety, electron affinity, atomic and ionic radii). Grouping of elements, their properties and uses. Isotopes and radioactivity.

5 **Electronic Theory of Valency and Chemical Bonding (8 lectures):** Different types of bonds (ionic, covalent, co-ordinate, hydrogen and metallic) Classification of solids on the basis of bonding and their properties. Atomic orbital's and their hybridization; valence bond and Molecular orbital theories.

6 **Chemistry of Transition Elements, Lanthanides and Actinides (7 lectures):** Definitions, electronic configurations, preparations (nuclear transformations), general properties and uses.

Recommended Books:

Text Books:

1. **R. D. Madan**: *Modern Inorganic Chemistry*.
2. **M. M. Haque and M. A. Nawab**: *Principles of Physical Chemistry*.
3. **E. S Gilreath**: *Fundamental Concepts in Inorganic Chemistry*.

Reference Books:

1. **G. M. Barrow**: *Physical Chemistry*.
2. **W. J. Moore**: *Physical Chemistry*.
3. **K. J. Laidler and J.H. Meiser**: *Physical Chemistry.*
4. **S. R. Palit**: *Elementary Physical Chemistry*.
5. **S. Z. Haider**: *Modern Inorganic Chemistry*.
6. **Companion**: *Chemical Bonding*.
7. **Cotton, Wilkinson & Jones**: *Basic Inorganic Chemistry*.
8. **D. K. Sebera**: *Electronic Structure and Chemical Bonding*.

ENG1111: Technical and Communicative English

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

1. **Grammar**: Grammatical principles, modals, phrases & idioms, prefixes & suffixes, sentence structures, why & yes/ no questions, conditional sentences.
2. **Vocabulary**: Technical & scientific vocabulary, defining terms.
3. **Spoken English**: Introduction to phonetic symbols, dialogue, responding to particular situations, extempore speech

Section-B

1. **Reading**: Comprehension of technical & non-technical materials-skimming, scanning, inferring & responding to context.
2. **Technical Writing**: Paragraph & composition writing on scientific & other themes, report writing, research paper writing, library references.
3. **Professional communication**: Business letter, job application, memos, quotations, tender notice.

Marks Distribution

Students have to write four questions taking two from each section. Marks distribution for each section is as follows:

Section A: 17.5 Marks
Section B: 17.5 Marks

Note: If necessary, the assigned course teacher may change the number of question and patterns of marks distribution.

Recommended Books:

1. **A. J. Thomson & A. V. Martinet**: *A Practical English Grammar*.
2. **John M. Lennon**: *Technical Writing*.
3. **A. Ashley**: *Oxford Handbook of Commercial Correspondence*.
4. **J. Swales**: *Writing Scientific English*.
5. **Robert J. Dixson**: *Complete Course in English*.
6. **Rajendra Pal & J. S. Korlahalli**: *Essentials of Business Communications*.

Part-I (Even Semester)

ICE1211: Computer Programming
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

File Management in C: Introduction, defining and opening a File, closing a file, Input/output operations on files.

Section-B

Pointers: Introduction, Accessing the address of a variable, Declaring pointer variable,, accessing a variable through its pointer, pointers and arrays, pointers and character string, array of pointers, pointers as function arguments, pointers to function, pointers to structure.

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, Arrays within structure, structure within structure, structures and functions, Union, Sizes of structure, Accessing Structure Members, Structure Initialization, Arrays of Structures.

Recommended Books:

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

ICE1221: Basic Electronics
50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

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.

Section-B

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.

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

Recommended Books:

1. R L Boylestad	**:**	Introductory Circuit Analysis
2. R L Boylestad	**:**	Electronic Devices and Circuits Theory
3. Millman and Halkias	**:**	Electronic Devices and Circuits
5. Gupta & Kumar	**:**	Handbook of Electronics

MATH1211: Differential and Integral calculus

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

1. **Functions:** Domain, Range, Inverse function and graphs of functions, Limits, Continuity, 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. **Application of Derivatives**.

Section-B

5. **Indefinite Integrals**: Method of substitution, Integration by parts, Special trigonometric functions and rational fractions.

6. **Definite Integrals**: Fundamental theorem, General properties, Evaluations of definite integrals and reduction formulas.

7. **Multiple Integrals**: Determination of lengths, Areas and Volumes.

Recommended Books:

Text Books:
1. **B. C. Das and B.N.Mukherjee**: *Differential Calculus.*
2. **B. C. Das and B.N. Mukherjee**: *Integral Calculus.*

Reference Books:

1. **F. Ayres**: *Calculus*.
2. **Edwards**: *Differential Calculus*.
3. **Williamson**: *Integral Calculus.*
4. **Muhammad and Bhattacherjee**: *Differential Calculus*.
5. **Muhammad and Bhattacherjee**: *Integral Calculus.*

STAT 1211: Statistics for Engineers

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

1. **Analysis of statistical data:** Location, Dispersion and their measures, Skewness, Kurtosis and their measures, Moment and Cumulants and Practical examples.
2. **Probability:** Concept of probability, Sample Space, Events union and Intersection of Events. Probability of events, Loss of probability, Conditional probabilities. Bose Einstein Statistics. Bay's Theorem, Chebysec's Inequality and Practical examples.
3. **Random variables and probability Distribution:** Basic concepts, Discrete and continuous random variables, Density and distributional functions, Mathematical expectation and variance, Joint marginal and conditional density functions. Conditional Expectation and conditional variance. Moments and Cumulant generating functions. Characteristic function. Study of Binomial Poisson, Normal and Bivariate Normal distribution and Practical examples.

Section-B

4. **Linear Regression**: Correlation, Rank correlation. Partial and Multiple correlations Linear Regression for two Variables, Principle of Least Squares Method, Lines of best fit, Residual Analysis and examples.
5. **Test of Significance**: Basic ideas of Null hypothesis, Alternative hypothesis, Type-I error Type-II error level of significance Degree of freedom, Rejection region and Acceptance region. Test of Single mean, Single variance, Two sample means and Variances. Test for 2×2 contingency tables, Independence test and practical examples.

Recommended Books:

Text Books:
1. P.G.Hoel. : Introductory Statistics
2. S.G. Gupta : Fundamentals of Statistics

Reference Books:
1. A.J.B.Anderson : Interpreting Data.
2. H. Cramer : The Elements of Probability Theory.

3. D.V.Lindley : Introduction to Probability and Statistics
4. S.Lipschutz. : Probability
5. Mosteller, Rourke & Thomas : Probability with Statistical Applications;
6. F.L.Wolf. : Elements of Probability and Statistics
7. T.H. Wonnacot & R.J.Wonnacot : Introductory Statistics,
8. Yule & M.G.Kendall. : An Introduction to the Theory of Statistics

PHY1221 Applied Electricity and Magnetism

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

1. **Electrostatics:** Electric dipole; electric field due to a dipole; dipole on external electric field; Gauss's Law and its applications.
2. **Capacitors:** Parallel plate capacitors with dielectric; dielectrics and Gauss's Law; susceptibility, permeability, and dielectric constant; energy stored in an electric field.
3. **Electric Current:** Electron theory of conductivity; conductor, semiconductors and insulators; superconductors, current and current density; Kirchhoffs Law and its applications.

Section B

4. **Electomagnetic Induction:** Faraday's experiment; Faraday's law; Ampere's law, motional e.m.f.; self and mutual inductance galvanometers-moving coil, ballistic and deadbeat types.
5. **Thermoelectricity:** Thermal e.m.f; Seebeck, Peltier and Thomson Effects; laws of addition of thermal e.m.f., thermoelectric power.
6. **DC and AC Circuits:** D.C. circuits with LR, RC, and LCR in series; A.C. circuits with LR, RC, LC, and LCR in series, Power calculation, Power factor improvement.

Recommended Books:

1. **Acharyya**: *Electricity and Magnetism*
2. **Admas & Page :***Principles of Electricity*
3. **Emran *et al.:*** *Text Book of Magnetism and Electricity*
4. **Halliday & Resnick:***Physics (Part-I & II)*
5. **Kip :***Fundamentals of Electricity and Magnetism*
6. **Huq *et al. :***Concept of Electricity and Magnetis*

ECON1211: Economics

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

1. **Basic Concepts of Economics:** Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.
2. **Theory of Demand, Supply and Consumer Behavior:** Law of Demand; Demand schedule and demand curve; Supply law, Supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply
3. **Production and Costs and Theory of the Firm:** Meaning of production; Factors of production; Concepts of total, average and marginal costs, fixed and variable costs.

4. **Theory of the Firm:** Perfect competition and monopoly; Total, average and marginal revenue of a firm; Average and marginal revenue under perfect competition and monopoly; Firm's Equilibrium; Equilibrium of firm under perfect competition and monopoly.

Section-B

5. **The Input-Output Analysis:** Meaning of input-output analysis; Input-output analysis model; balance equation; coefficient matrix; Determination of final demand vector.
6. **Basic Concepts of Macroeconomics:** Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics.
7. **National Income accounting and determination:** Concepts of GNP, GDP and national income; Methods of national income accounting; Problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model.
8. **Budgets of Bangladesh:** The revenue at the capital budget; Income, expenditure of the government; direct and indirect taxes.
9. **Development Planning in Bangladesh:** Need for planning in Bangladesh; Various five year plans in Bangladesh; Development strategies in the five year plans of Bangladesh.

Recommended Books:

1. **Semuelson and Nordhous**: *Economics*.
2. **Byrons and Stone**: *Economics*.
3. **Dewett, K. K..**: *Modern Economic Theory*.
4. **Ahuja, H. L.**: *Advanced Economic Theory*.
5. **Government of Bangladesh**: *Various Five Year Plans*.

Part-II (Odd Semester)

ICE2111: Electronics Circuit and Semiconductor Devices

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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, Impedance coupled two-stage amplifier, Transformer coupled two-stage amplifier, DC two-stage amplifier, 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.

Section-B

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: Firs and Second order Butter worth filter, High-pass filter: First and second order Butter worth filter, Higher order filters, Band-pass filters, 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.

Recommended Books:

1. Allen Mottershead	:	Electronic Devices and Circuits
2. Millman and Halkias	:	Electronic devices and Circuits
3. Malvino	:	Electronic Principles
4. S.L. Gupta and Kumar	:	Electronics

ICE2121: Analog Communication

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credit, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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.

Section-B

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.

Recommended Books:

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

ICE2131: Signals and Systems

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33 Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

Section-B

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.

Recommended Books:

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

MATH2111 Matrices and Differential Equations

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-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.

Section-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 and transformation, Poisson's equation, Helmholtz's equation, Diffusion equation, Green's function solution, Integral equation.

Recommended Books:

Text books:

1. **M. L. Khanna**: Matrices
2. **S. L. Ross**: Introduction of Ordinary Differential Equations

Reference Books:

1 **F. Ayres**: *Theory and problems of Matrices.*
2. **Moduffe**: *Theory of Matrices.*
3. **F. Ayres**: *Differential Equations.*
4. **B. D. Sharma**: *Differential Equations.*
5. **L. Pipes**: App. *Mathematics for Engineers and Physicist.*
6. **I. S. Sokolnikoff & R. M. Redheffer**: *Mathematics for Physics and Modern Physics.*

STAT2111: Basic Theory of Statistics

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section – A

1. Parent and Sampling Distributing: Different parent distribution, Fisher's Lemma. Study of χ^2Distribution, T-Distribution and F-Distribution, Properties, uses & Applications. Distribution of sample correlation coefficient in the null case. Sampling Distribution of the Medians and Range.

2. Elements of Point Estimations: Basics Concepts, Consistent estimates, unbiased estimates, mean and variance of estimates, ideas of efficiency, principle of maximum likelihood, illustration from Binomial Poisson and Normal Distributions,

Section – B

3. Decision rules: Statistical Decision; Critical Region, Best Critical Region; Two types of Errors, Procedure of test of Hypothesis; Most powerful test; Standard Errors.

4. Test of Significance: Test of Single mean and single variance, Comparison of two sample means, Proportions and variances, Bartlett's Tests 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 ample test of significance, Non parametric test, One sample and two sample sign test, Run test and Rank sum test.

Recommended Books:

1. Albarto Leon-Garcia: Probability and Random Processes for Electrical Engineering
2. R. L. Anderson, T. A. Bancroft : Statistical Theory in Research, McGraw-Hill N. Y. Banctoft, T.
3. G. Beaumont. :Intermediate Mathematical Statistics, Third Ed. Chapman and Hill, London
4. Gutman, Wilks and Hunter : Introductory Engineering Statistics Fourth Ed. John Wiley and Sons,
5. P. G. Hoel : Introduction to Mathematical Statistics, Fifth Ed. John Wiley and Sons, N. Y.
6. R. V. Hogg. and A. T. Graig, : Introduction to Mathematical Statistics Fourth Ed. Collier Macmilan, N. LY.
7. M. G. Kendall and A. Stuart A. : The Advanced Theory of Statistics Vol. 1, Fourth Ed. Charles Griffin and Co. London.
8. B. W. Lindgren : Statistical Theory, Third ed. Collier-Macmillan Co; N. Y.
9. Mood, Graybill and Boes : Introduction to the Theory of Statistics, Third ed. McGraw-Hill, N. Y.

ACCO2111: Industrial Management and Accountancy

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A: Industrial Management

Business and Industry: Basic concept of business and Industry, objectives of business, types of Business, types of industry, business and society, business environment, and ethical issues of business.

Management and Organization of Industrial Establishment: Concept of management, management principles and functions: planning, organizing, leading, and controlling, levels of management, manager and roles of management, scientific management and core management skills, corporate activities, corporate social responsibility, concept of business management, organizational structure of industrial organization.

Management and Marketing Strategy : Concept of strategy, strategy formulation, SWOT analysis, PPM, competitive superiority, customer satisfaction, alliance, merger and acquisition, integration, concept of market and marketing, market research, sales/product planning, sales promotion, customer satisfaction survey, business strategy and goal evaluation, business management system, strategy formulation in IT industry, strategy IT industry, technological development strategy, and planning

Human Resource Management and Industrial Relations: Concept of HRM, HRM functions and model, recruitment, selection, industrial relations and disputes. grievance, handling of grievances, labor welfare, workers' participation in management, motivation employees in the industry , leadership, payment of industrial workers, job satisfaction and job enrichment, training, and trade union, and collective bargaining.

Health, Safety, and Industrial Environment: Classification of accidents, causes of accidents, effects of accidents, safety consciousness & publicity, safety procedures, safety measures, basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise.

Managing Industrial Project: Concept of project and project management, project life cycle, project scope management, project proposal, scheduling and budgeting, procurement, project monitoring and evaluation

Service Management: Concept of service and service management, service management in IT industry, ITIL system diagram, ITIL framework, service support, service delivery, facility management, system audit and internal control

Materials Management: Material in industry, inventory control model, ABC analysis, safety stock, reorder, level, economic ordering quantity, stores equipment, stores records, purchasing procedures, purchase records, bin card, cardex, material handling, manual lifting, hoist, cranes, conveyors, trucks, fork trucks.

Operations research and Industrial Engineering: Concept of operation research, charts and diagram of understanding operations, methods of job analysis and operational planning, methods of decision making, problem solving methods, concept of standardization, standardization organizations and specifications, examples of standardization.

Section-B: Accountancy

Accountings: History, scope and nature of accounting, purpose of accounting, accounting equation, meaning and classification of account, double entry system, rules for determining debit and credit, accounting cycle journal, ledger and trial balance

Cost Concepts and Cost-Volume-Profit Relationship: Meaning of cost, different types of costs, contribution margin and ratio analysis, break-even analysis, CVP relationship in Graphical Form and target net profit analysis

Recommended Books:

VK Sharma: OP Harkut.:Industrial Management

M. C. Shukla: Business Organization and Management.

Samuel C. Certo: Modern Management.

Krajewski and Ritzman: Operation Management.

David A. Decenzo and Stephen P. Robbins: Human Resource Management.

Hermanson Etar: Accounting Principles.

Ray H. Garrison: Managerial Accounting

Sharma BR: Environmental and Pollution Awareness.

Part-II (Even Semester)

ICE2211: Electromagnetic Fields and Waves

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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; Lorenz′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. Pointing 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 ionosphere.

Section-B

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; Distortion less 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.

Recommended Books:

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.
4. D. K. Chang	:	Electromagnetic Fields and Waves

ICE2221: Cellular and Mobile Communication

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3 credits, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction: Evolution of mobile radio communication, Introduction to 2G, 2.5G and 3G wireless Networks, Paging, cordless Telephony, Cellular Telephony, Basic idea of WLL, LMDS, Bluetooth, WPAN, PCS, WLAN, WWAN, ALOHA, GPS.

Cellular Concept-System Design Fundamentals: Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies: Prioriting Handoffs, Practical Handoff Considerations, Interference and system capacity: Co-

channel Interference, Adjacent Channel Interference, Channel Planning, Power control for Reducing interference, Trunking & GoS, improving coverage and Capacity in Cellular System: Cell Splitting, Sectoring, Mirocell Zone Concept.

Section-B

Mobile Radio Propagation: Large-scale propagation models, Free space propagation model, basic propagation mechanisms, Ground reflection (Two-Ray) model, Fresnel zone geometry, Knife-edge diffraction model, Multiple knife-edge diffraction, Log-distance path loss model, Log-normal shadowing, Determination of coverage area, Outdoor propagation models, Okumura model, Hata model, PCS extention to Hata model, Indoor propagation models, Partition losses, Attenuation factor model, Signal penetration into buildings, Small-scale fading and multipath propagation, Factors influencing small-scale fading, Doppler shift, Parameters of mobile multipath channels, Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, Types of small scale fading, Fading effects due to multipath time delay spread and Doppler spread, Rayleigh and Ricean Distributions.

Wireless Systems and Standards: AMPS and ETACS: System overview, Call handling and Air interface, United States Digital Cellular (IS-54 and IS-136), GSM: Services and features, System architecture, Radio subsystem, GSM channel types, Frame structure, Signal processing in GSM, IS-95: Frequency and channel specifications, Forward and reverse CDMA channels.

Recommended Books:

1. T S Rappaport : Principles of Wireless Communication
2. Pahlavan and Krishnamurty : Principles of Wireless Network
3. VK Garg and J E Wilkis : Principles and Application of GSM
4. VK Garg : IS 95 CDMA and CDMA2000
5. Y. Lee : Mobile Cellular Communication

CSE2261: Introductory Data Structures

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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.

Section-B

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 & Searching: : Sorting, Insertion sort, Shell sort, Heap sort, Radix sort, The general method of divide & conquer method, Merge sort, Quick sort, Selection sort, binary search.

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

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

Recommended Books:

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

MATH2221: Discrete Mathematics and Numerical Methods

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 5 periods/week, Lectures: 55, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section A: Discrete Mathematics

Mathematical Logic: Connectives, theory of inference for proposition calculus, predicate calculus, inference theory of predicate calculus, method 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 di-graph.
Functions: definition, composition of function, inverse function, binary and array operation.
Graph: Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, shortest path problems, graph colouring, matrix representation of graph.
Trees: Introduction of trees, application of trees, tree traversal, labelling trees, trees and sorting, spanning trees, minimal spanning tree, undirected trees.
Languages and Grammars: Definition of a Formal language, Phrase-Structure Grammer-Types of Grammers, Derivation tree, Backus-Naur Form.

Section B: Numerical Methods

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors.
Roots of Equations: The Bisection Method, the False-Position Method, the Iteration Method, the Newton-Raphson Method.
Interpolation: Newton's Forward and Backward Formula for Interpolation with equal distance, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials.
Curve Fitting: Linear Regression, Linear Curve Fitting Methods, Least Square Method, Non-Linear Curve Fitting Methods, Polynomial of *n*th Degree, Power Function, Exponential Function, Polynomial Regression.
Numerical Differentiation and Integration: The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments.
Numerical Solutions of Ordinary Differential Equations: Solution by Taylor's Series, Picard's Method, Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods.

Recommended Books:

1. **Lipshutz**: *Theory and Problems of Discrete Mathematics, Schaum's outline series*.
2. **C.L. Liu**: *Elements of Discrete Mathematics, 2nd Ed, McGraw-Hill, 1985*. 3. **Sharon Ross**: *Discrete Mathematical Structure*.
3**. S.S.Sastry**: Introductory Methods of Numerical Analysis.

SOCI2211: Sociology

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

1. **Sociology**: Definitions, nature & scope, origin & development, relationship with other disciplines and natural sciences, scientific method and techniques for sociological investigation, objectivity in sociology.
2. **Sociological perspectives**: Sociology & commonsense, sociological imaginations, functionalist, conflict, inter-actionist perspectives.
3. **Basic concepts**: Group, society, community, association, institution, organization, culture, material and nonmaterial culture, cultural lag, civilization, norms, values, folkways, mores, cultural traits, cultural unity and diversity, acculturation, assimilation, diffusion, enculturation.
4. **Types of society**: Hunter gatherer society to capitalist industrial society and late capitalism.
5. **Social process**: Cooperation, competition and conflict, socialization and its agent, personality development.
6. **Social institutions**: Family, marriage, kinship, property, religion, economy and political institutions, functionalist and conflict perspectives about institutions.
7. **Social structure**: Components of social structure, theories of social structure, social inequality and stratification, class structure, systems of stratification and social mobility, functionalist and conflict perspectives about social stratification.
8. **Population and environment**: Population growth, ecological balance, ecosystem, threats to global environment, environment as a social issue.
9. **Social change and development**: Social change, factors of change, progress, evolution, development, theories of social change, planned change, technology and social change, social problems, cause and consequences of social problems, social disorganization and deviance.

Recommended Books:

Alex Inkels: *What is Sociology*
Anthony Giddens: *Sociology*
Bottomore Sociology: *A Guide to Problems and Literature*
Cuff, Sharrock & Francis: *Perspective in Sociology*
Ian Robertson: *Sociology*
Lenski etal.: *Human Societies*
Moore: *Social Change*
Pascal Gisbert: *Introduction to Socilogy*
Scarpitti & Anderson: *Social Problems*
Schaefer & Lamm: *Introducing Sociology*

Part-III (Odd Semester)

ICE3111: Microwave Communication and Radar

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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.

Section-B

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.

Recommended Books:

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.
7. S. Gupta	:	Microwave Engineering.

ICE3121: Digital Signal Processing

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Discrete Fourier Transform: Frequency-domain sampling, Discrete Fourier Transform (DFT), Properties of DFT, Linear filtering and frequency analysis of signals using DFT, Discrete Cosine Transform.

Efficient Computation of DFT: Fast Fourier Transform (FFT) algorithms, Applications of FFT algorithms, Linear filtering approach to the computation of DFT, Quantization effects in the computation of DFT.

Digital Filters: Causality, Symmetric and Antisymmetric Finite Impulse Response (FIR) filters, Linear-phase FIR filters, FIR differentiator, Hilbert transformer, Infinite Impulse Response (IIR) filter design methods, Frequency transformations.

Section-B

Multirate Signal Processing: Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion (SRC), Filter design for SRC: Direct Form FIR Digital Filter Structure, Cascade Form FIR Digital Filter Structure, Polyphase FIR Structure, 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: The Periodogram method, Bartletts method, Welch's method, Blackman-Turkey method, Parametric Methods: Autocorrelation method, Co-variance method, Modified Co-variance method, Burg method, Frequency Estimations.

Adaptive Filtering: Introduction, FIR Adaptive Filters, Adaptive Recursive Filters, Recursive Least Squares: Exponentially Weighted RLS, Sliding window RLS (WRLS).

Recommended Books:

1. J G Proakis & D G Manolakis	:	Digital Signal Processing- Principles an Application
2. M H Hayes	:	Statistical Digital Signal Processing
3. Oppenheim and Schaffer	:	Digital Signal Processing

ICE3131: Digital Image Processing

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

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.

Section-B

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.

Recommended Books:

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

ICE3141: Antenna Engineering

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

Section-B

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.

Recommended Books:

1. C A Balanis : Antenna Theory
2. J D Kraus : Antennas

ICE3151: Satellite Communications

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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,

Section-B

Digital satellite communication: ; Multiple Access methods.; Single access; Preassigned FDMA; Demand-Assigned FDMA; Spade system; TDMA; Frequency reuse; Satellite switched TDMA; Time slot arrangement; Frame and burst syscronization; Scanning spot beam; Satellite switching and on board processing; Digital speech interpolation; echo and delay cancellation.

Recommended Books:

1. D. Roddy and Coolen : Electrical Communication.
2. Carter : Communication Satellite
4. Tri T. Ha : Digital Satellite Communications

Part-III (Even Semester)

ICE3211: JAVA and Network Programming

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66,Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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.

Section-B

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.

Recommended Books:

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

ICE3221: Digital Communication

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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.

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.

Section-B

Digital Modulation Techniques: Digital Modulation, Factors that Influence the Choice of Digital Modulation, Phase Modulation, Pulse modulation: Types, PWM, PPM, Linear Modulation: BPSK, DPSK, QPSK, $\pi/4$ QPSK, Offset QPSK, QAM; M-ary Modulation Techniques, Power spectrum, Bandwidth Efficiency, Spread Spectrum Modulation Technique: FHSS and DSSS.

Waveform Coding Techniques: Sampling theorem, Reconstruction of a message process from its samples, Signal distortion in sampling, 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.

Recommended Books:

1. S Haykin : Digital Communication Systems
2. Kennedy-Davice : Electronic Communication Syatems
3. Theodore S. Rappaport : Wireless Communications: Principles & Practice.

ICE3231: Telecommunication Systems, Networks and Switching

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction: Simple telephone communication, Basic switching system, Transmission bridge, Subscriber line circuit, CB cord circuit, Junction working.

Strowger Switching Systems: Relay dial telephone, Signaling tones, Strowger switching component, Step-by-step switching, Design parameters, 100-line switching system, 1000-line blocking exchange, 10,000-line exchange.

Crossbar Switching: principle of common control, Touch tone dial telephone, principles of crossbar switching, Crossbar switching configuration, Cross point terminology, Crossbar exchange organization.

Telephone Networks: Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems, Numbering plan, Charging plan, Signaling techniques, Inchannel signaling, Common channel signaling.

Section-B

Electronic Switching: Stored program control, Centralized SPS, Software architecture, Application software, Enhanced services, Two-stage network, Three-stage network, n-stage network, Concept of TDM, Basic time division space switching, Basic time division time switching, Time multiplexed space switching, Time multiplexed time switching, Combination switching, Three-stage combination switching, n-stage combination switching.

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

Recommended Books:

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

ICE3241: Optical Fiber Communication

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

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.

Optical Communication Equipments: - Principles, Technology, Characteristics of Optical Sources (LED, Laser) and Optical Detectors (PIN type), receiver noise consideration, Preparation of optical fibers, Optical fiber cables, Fiber splices, Fiber connectors, Fiber couplers and Integrated Optics.

Section-B

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.

Recommended Books:

1. J.M.Senior : Optical Fiber Communication
2 D. Roddy and Coolen : Electronic Communications
3. Barnoski : Fundamental of Optical Fiber Communication
4. Palaise : Fiber Optic Communication

Part-IV (Odd Semester)

ICE4111: Artificial Intelligence and Neural Computing

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section

Section-A

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

Section-B

Introduction to Selected Topics in AI: Game Playing, Natural language processing, Expert system, Genetic algorithm, Robotics and Fuzzy logic.
Neural Networks: Definition, Benefit, Human Brain, Models Of Neuron, Types Of Activation Function, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.
Learning Process: Error-Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Boltzmann Learning, Statistical Learning Theory.
Perceptron: Perceptron, Perceptron Convergence Theorem, Multilayer Perceptron, Back-Propagation Algorithm, XOR Problem, Decision Rule, Differentiation, Hessian Matrix, Generalization, Cross-Validation, Network Prunning Technique, Convolutional Network.

Recommended Books:

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

ICE4121: Computer Architecture and Organization

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
3credits, 4 periods/week, Lectures: 44, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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

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.

Section-B

Microprocessors: Evolution of microprocessors, microprocessor organization, 8086 microprocessors, microprocessor applications, series of Intel and Pentium microprocessors.
Processor basics: CPU organization, information and number formats, instruction set, instruction format and instruction types, addressing modes.
System Organization: Basic concepts, Bus control, Arbitration, Programmed I/O, DMA and Interrupts, I/O processors, I/O interface circuit

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

Recommended Books:

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

ICE4131: Wireless Communication

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction: History, Wireless vision, Technical issues, Current wireless Systems, Wireless spectrum, Standards.
Statistical Multipath Channel: Transmit and receive signal models, 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 feedback equalizer; Training and tracking for Adaptive equalization.

Section-B

Multiuser Systems: Multiuser Channels: The Uplink and Downlink, Multiple Access: Frequency-Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code-Division Multiple Access (CDMA), Space-Division, Hybrid Techniques, Random Access: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access, Downlink (Broadcast) Channel Capacity: Channel Model, Capacity in AWGN, Uplink (Multiple Access) Channel Capacity: Capacity in AWGN.
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, Challenges in MCM.
Multiple Antennas and Space-Time Communications: Narrowband MIMO Model, Parallel Decomposition of the MIMO Channel, MIMO Channel Capacity**:** Static Channels, Fading Channels, MIMO Diversity Gain: Beam forming, Diversity/Multiplexing Tradeoffs **,**Space-Time Modulation and Coding,: ML Detection and Pair wise Error Probability, Rank and Determinant Criterion, Space-Time Trellis and Block Codes, Spatial Multiplexing and BLAST Architectures, Frequency-Selective MIMO Channels, Smart Antennas.

Recommended Books:

1.A J Goldsmith	:	Wireless Communication
2. T S Rappaport	:	Wireless Communication: Principles and Practices
3. A Molisch	:	Wireless Communication

ICE 4141: Database Management System

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Introduction: Overview, File systems versus database systems, View of data, Data models, Database users and administrators, Transaction management, Database system structure, Applications.
The Entity-Relationship Model: Basic concept, Design issue, Mapping constraints, Keys, E-R diagram, Weak entity sets, Extended E-R features, Design of an E-R database schema, Reduction of an E-R schema to table.
Relational Database System: Structure of relational databases, The relational algebra, Extended relational-algebra operations, Modification of the database, Views, Normalization.
Integrity and Security: Domain constraints, Referential integrity, Assertions, Triggers, Security and authorization, Authorization in SQL, Encryption and authentication.

Section-B

Structured Query Language: Data Definition, Basic Structure of SQL query, Set operation, Nested queries, Aggregate operations, Null values, Complex queries, Embedded SQL, Cursors, Dynamic SQL, ODBC and JDBC, Triggers and active database.
Transaction: ACID properties, Transaction state diagram, Implementation of atomicity and durability, concurrent executions, Serializability, Recoverability, Implementation in isolation, Transaction definition in SQL, Testing for serializability.
Concurrency control and Recovery System: Lock based protocols, Timestamp based protocols, Multiple granularity, Deadlock handling, Insert and Delete Operations, Failure classification, Storage structure, Recovery and atomicity, Recovery with concurrent transaction.

Recommended Books:

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.

ICE4151: Information System Analysis and Design

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
2 credits, 3 periods/week, Lectures: 33, Exam time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Introduction: Definition of systems concept; Characteristics of a system: Organization, interaction, Interdependence, Integration, central objective; Elements of a system: outputs and inputs, Processor (s), control, feedback, environment, boundaries and interface; Types of systems: physical or abstract systems, open or closed systems, man-made information systems; The major information systems.
The System Development Life Cycle: The system development life cycle; Feasibility study; Analysis; Design; implementation; Post-implementation and Maintenance; Prototyping.

The Role of the Systems Analyst: Definition; What does it take to do systems analysis? Academic and personal qualifications; The analyst /user interface: Behavioral issues, Conflict resolution; The MIS organization.
Systems Analysis: Introduction; Bases for Planning in systems analysis: Dimension of planning; Initial Investigation: Needs identification, determining the user' information requirements; Fact-finding.

Section-B

Information Gathering: Introduction; what is structured analysis?; where does information originate?; Information gathering tools: Review of Literature, Procedures and forms, On-site observation, Interviews and questionnaires; Types of interviews and questionnaires.
The tools of structured analysis: Introduction; What is structured analysis?, The tools of structured analysis: The date flow diagram (DFD), Data Dictionary, Decision tree, structured English, Decision tables; Pros and cons of each tool.
Feasibility Study: System performance definition; Feasibility Study: Feasibility Considerations, stepsin feasibility analysis, Feasibility report, oral presentation.
Cost/Benefit Analysis: Data analysis; cost/Benefit analysis: cost and benefit categories, procedure for cost/benefit determination, The system proposal.

Recommended Books:

1. E. M. Award	:	System Analysis and design
2. P. Edward	:	System Analysis and design
3. J. G-Burch Jr. F.R.	:	Information System
4. G. Scott	:	Principle of Management Information System
5. A. Daniels and J Yeates	:	Basic System Analysis

Part-IV (Even Semester)

ICE4211: Computer Networks

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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

Section-B

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

Recommended Books:

1. A. S. Tanenbaum : Computer Networks

2. B. Forouzan : Data Communication Networking.

ICE4221: Fundamentals of Cryptography

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction of Classical Encryption Techniques: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques – Caesar cipher, Monoalphabetic ciphers, Playfair cipher, Hill cipher, Polyalphabetic cipher, One-time pad, Transposition Techniques.
Block Cipher: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic.
Advanced & Contemporary Symmetric Cipher: Evaluation Criteria For AES, The AES Cipher, Multiple Encryption and Triple DES, Stream Ciphers and RC4.
Confidentiality Using Symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation

Section-B

Public-Key Encryption: Introduction to number theory, Principles of Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography, the RSA Algorithm.

Key Managementand Elliptic Curve Cryptography (ECC): Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, ECC-Key exchange using ECC, Elliptic Curve Encryption/Decryption.
MAC and Hash Function: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Security of Hash Functions and MACs, MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.
Hash Algorithm, Digital Signatures and Authentication Protocols: Secure Hash Algorithm, HMAC, HMAC Design Objectives, Digital Signature, Authentication Protocols, Digital Signature Standard, Mutual Authentication, One-Way Authentication, Digital Signature Standard.

Recommended Books:

1. William Stallings : Cryptography and Network Security: Principles and Practice
2. Bruce Schneier : Applied Cryptography

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ICE4231: Information Theory and Coding

100 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
4 credits, 6 periods/week, Lectures: 66, Exam time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

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

Section-B

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 No overlapping 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

Recommended Books:

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