**IIT**

# Syllabus For

## B.Sc. (Honors) in Information Technology

SESSION: 2011-2012 TO 2014-2015
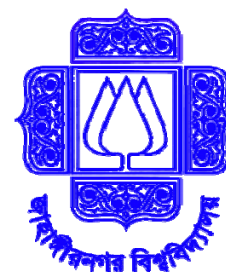
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**INSTITUTE OF INFORMATION TECHNOLOGY**

**JAHANGIRNAGAR UNIVERSITY**
**SAVAR, DHAKA-1342**

**SYLLABUS FOR B.SC (HONORS) IN INFORMATION TECHNOLOGY**
**SESSION: 2011-2012 TO 2014-2015**

## Program:

B. Sc. (Hons.) in Information Technology shall extend over a period of four academic years and will consist of eight semesters. The program is hereinafter called Undergraduate Program. Each year will divide into two semesters. Each semester will have the duration of six months. Students shall be evaluated in each semester. A semester will be segmented into Class-weeks, Preparatory leave and Semester-end examination. The total time distribution for completing a semester will be as follows:

| Sl. | Segment | Period | Length |
|---|---|---|---|
| I. | Classes | 1st Week to 13th Week | 14 Weeks |
| II. | Preparatory leave before semester-end examination | 14th Week | 1 Weeks |
| III. | Semester-end examination | 15th Week to 17th Week | 3 Weeks |
| IV. | Result Publishing & Semester Break | 18th Week to 21st Week | 3 Weeks |
| | | Total | 21 Weeks |

During class-weeks, if classes do not held in any particular week due to the reason beyond the control of the university, the week shall deem to be an effective class-week, if number of working days is equal to or more than three.

## Admission:

Admission of students and Examination of courses to the B.Sc. (Honors) program shall be guided by the Admission Ordinance and the Examination Ordinance of the University.

## Eligibility:

Eligibility of students for taking part into the admission test shall be determined and guided as per rules of the University.

## Admission Test:

Procedures for admission test shall be guided by the rules of the University. Along with that a student will be considered eligible for admission if he/she obtains minimum 30% marks in Physics and minimum 40% marks in Mathematics. Information relating to the detail syllabus, type & format of questions, date, time and place of the admission test will be found in the prospectus, daily news papers and also available on the web site **http://www.juniv.edu/iit/**

## Selection Procedure:

Selection procedure shall be guided as per rules of the University.

## Rules for Admission:

Procedures for admission shall be guided as per rules of the University.

## Tuition & Other Fees:

Tuition fees and the mode of payment for four years program shall be guided as per rules of the university.
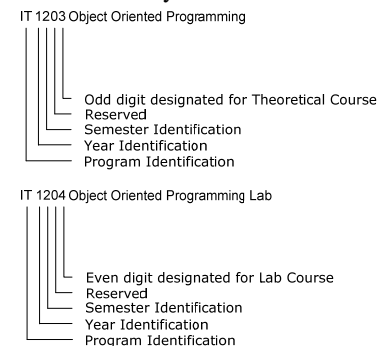
## Course Offering and Instruction:

The courses to be offered in a particular semester are announced and published in the Registration Package along with the tentative semester schedule before the end of the previous semester. The courses to be offered in any semester will be decided by the Committee of Courses for Undergraduate Program. Each course is conducted by a course teacher who is responsible for maintaining the expected standard of the course and for the assessment of students' performance. One of the course teachers or any other member of the teaching staff of the Institute will be designated as course coordinator for each semester. He/she has the full responsibility for coordinating the work of the other members of the Institute involving in that semester.

## Course Pattern and Credit Structure:

The undergraduate program is covered by a set of theoretical courses along with a set of laboratory courses to support them.

## Course Designation and Numbering System:

A course will be represented by course number, course title, credit hours and contact hours per week (Theory or Lab). Each course is designated by a three two letter code identifying the B. Sc. program offered followed by a four-digit number having the following interpretation: The first and second digits correspond to the year and the semester in which the course is normally taken by the students. The third digit is reserved for maintaining continuity. The last digit is an odd number for theoretical courses and an even number for laboratory courses.

IT 1203 Object Oriented Programming

Odd digit designated for Theoretical Course
Reserved
Semester Identification
Year Identification
Program Identification

IT 1204 Object Oriented Programming Lab

Even digit designated for Lab Course
Reserved
Semester Identification
Year Identification
Program Identification

The following example illustrates a course representation system:

| Course Code | Course Title | Credit Hrs | Class Hr/ Week |
|---|---|---|---|
| IT 1101 | Information Technology Fundamentals | 3 | 3 hrs. |

## Assignment of Credits:

The assignment of credits to a theoretical course follows a different rule from that of a practical or laboratory course. Courses of study for the B.Sc. (Hons.) in Information Technology are defined as per rules of the University.

**Credit Hour Requirement:**
The total contact hours for each 3 credit, Theoretical course is 45 hours and for each 1.5 credit Lab oriented course is 45 hours. Marks allocated for each course either theoretical or practical is 100. The evaluation of a course will be carried by taking tutorial examination and a final examination.

A student for the B.Sc. (Hons.) in Information Technology shall offer six to ten courses comprising of both theoretical and practical units in each semester. In the final semester (semester VIII) students have two options, each consisting of two courses. A student can choose any one of these two options to complete his/her degree as an IT major or Telecommunication major. A student will have to complete total 158 credit-hours of course of study during the four years' undergraduate program.

**Industrial/Professional Training Requirements:**
There shall be an Industrial/Professional training requirements at the end of fourth semester. The objective of the training program is to enlighten the students with practical orientation and give them an opportunity to make use of their theoretical concepts and practical skills in real life situations. All students will be placed in public and private sectors, particularly those organizations that are engaged in activities having direct relevance to the Information Technology and likely to enhance the knowledge and skill of the students. The training program shall extend over a period of minimum three weeks. The outcome of this program will be an Industrial/Professional training Report as prescribed in the syllabus. Training program shall be equivalent to a two credit hours laboratory course and shall be evaluated by this final report accordingly. The credit earned in this training program will not contribute the GPA/CGPA of the student but the student has to obtain a satisfactory (S) grade in this course to be promoted to the next semester.

**Placement of Students for Industrial /Professional Training Requirement:**
The academic committee of the Institute shall arrange for the placement of students and shall nominate internal and external supervisor(s) of the students going for Industrial Attachment. The Director of the Institute will send the names of the internal and external supervisors to the Director Controller of the Examination office for appointment.

**Thesis/Project Works:**
Thesis/Project work is required for the partial fulfillment of the completion of bachelor degree. A Committee shall be formed for monitoring the project works for undergraduate students. This committee will finalize the placement of students for Project and shall nominate supervisor, internal and external members. The Director of the Institute will send the names of the internal and external members to the Controller Director of the Examination office for appointment.

*Placement of Students for Thesis/Project Works:*
A student may apply for the evaluation of his/her project work after completing the minimum theoretical course works and CGPA required. The Committee for monitoring project works will finalize the Board of Examiners for the Project. The Board will consist of the director of the Institute, Supervisor(s), internal (minimum of two) and external members who will be an expert on the related fields.

**Assessment:**
For the purpose of Assessment, 100 marks shall be assigned to each three-credit hours' course. Assessment of a student in a course shall be based on marks obtained in the course-end examination (written) and class assessments/continuous assessment. Marks allotted for class assessment/continuous assessment shall be 40% of the total earn marked for each theoretical course and 60% for each practical course.

**Marks Distribution:**

| Theoretical Courses | |
| --- | --- |
| Class/Continuous Assessment | 40% |
| Final examination | 60% |
| Total | |

| Practical Courses | |
| --- | --- |
| Class/Continuous Assessment | 60% |
| Final examination | 40% |
| Total | |

*Class Assessment/Continuous Assessment and Submission of Assessment:*
Class assessment/Continuous assessment will consist of class attendance, written class tests, quizzes, project works, case studies, assignments, term papers and discussion sessions. For assessment of class test in theoretical courses there shall be a minimum of two tutorial tests (declared/undeclared) for each three-credit hours course. For assessment of class test in practical courses there shall be a minimum of two declared written tutorial tests for each three-credit hours' course. The distribution of marks for each theoretical course shall be as follows:

| Theoretical Courses | |
| --- | --- |
| Class participation / Attendance | 10% |
| Assignments, Term papers or other forms of assessment | 10% |
| Tutorial tests/Class tests | 20% |
| Semester-end Examination | 60% |
| Total | 100% |

The distribution of marks for each practical course will be as follows:

| Practical Courses | |
|---|---|
| Class participation / Attendance | 10% |
| Class test/Tutorial | 20% |
| Experiment Evaluation | 10% |
| Report | 10% |
| Quiz/Viva | 10% |
| Semester-end Examination | 40% |
| Total | 100% |

**Examinations:**
Final examination for each semester will be conducted as per Examination Ordinance for semester system in the university and controlled by Office of the Controller of Examination.

**Grading System:**
The Universal Grading System introduced by the University Grant Commission (UGC) of Bangladesh, will be followed which are given below. The total numerical marks obtained by a student in each course will be converted into Letter Grade (LG) and Grade Point (GP). According to the Grade Point, the GPA (Grade Point Average) and CGPA (Cumulative Grade Point Average) will be calculated. The conversion of Letter Grade and Grade Point will be as follows:

| Numerical Grade | Letter Grade | Grade Points |
|---|---|---|
| 80% and above | A+ | 4.00 |
| 75% to less than 80% | A | 3.75 |
| 70% to less than 75% | A- | 3.50 |
| 65% to less than 70% | B+ | 3.25 |
| 60% to less than 65% | B | 3.00 |
| 55% to less than 60% | B- | 2.75 |
| 50% to less than 55% | C+ | 2.50 |
| 45% to less than 50% | C | 2.25 |
| 40% to less than 45% | D | 2.00 |
| Less than 40% | F | 0.00 |
| Incomplete | I | |
| Satisfactory or Unsatisfactory | S or U | For Thesis, Industrial/ Professional Tanning etc. |
| Continuation | X | For Thesis, Industrial Attachment etc. |

**Earned Credits:**
1. The grades of the courses, in which a student has obtained minimum qualifying pass grade, shall only be counted as credits earned by him/her. Other grades shall not be counted for Grade Point Average (GPA) calculation.

2. If a student obtains an F grade in any course in any semester, he/she shall have to repeat the course(s), whenever offered within his/her total duration of academic years. In that case his/her earned credit shall not be more than B.
3. If a student obtains a grade I (incomplete) in one or more courses in any semester, he/she shall have to repeat the course(s), whenever offered within his total duration of academic years.

**Performance Evaluation:**
The performance of a student will be evaluated in terms of two indices: (i) semester grade point average (GPA) and (ii) Cumulative Grade Point Average (CGPA) which is the grade point average for all the semester completed.

Students will be considered to be making normal progress toward a degree if their Cumulative Grade Point Average (CGPA) for all work attempted is 2.00 or higher. Students who regularly maintain a GPA of 2.00 in each semester or better are making good progress toward the degrees and are in good standing with the University. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when any one of the following conditions exists.
The earned GPA in each semester falls below 2.00, or The Cumulative GPA falls below 2.00, or The earned number of credits falls below 15 times the number of semester attended.

All such students can make up their deficiencies in GPA and credit requirements by completing courses in the subsequent semester(s) and backlog courses, if there are any, with better grades. When the minimum GPA and credit requirements are achieved, the student is again returned to good standing.

**Class Attendance:**
To sit for the class assessment and course-end examination, a student must have to have minimum class attendance which will be guided by the rules of the university.

**Qualifying Marks:**
1. The qualifying pass grade in a particular course will be determined by the rules of the University. If any student gets F grade in one or more courses, he/she has to cover it within the time limit which is mentioned in section 19 of this ordinance.
2. If a candidate remains absent in a course-end Examination for a course for such reasons as serious illness, accident, or any valid reason, his/her course may be graded I (Incomplete). With subject to the approval of the concern authority of the University, he/she may get a chance to recover it like section 19.

**Promotion to next semester:**
A student must secure the minimum qualifying grade in each of the courses in the semester-end examination in order to be considered "pass" in that semester.

However, for promotion to the next semester, a candidate shall have to obtain a minimum GPA which will be followed as per University rules.

**Referred Examination:**
Matters relating to referred examination shall be guided by the rules of the University.

**Student Adviser:**
One adviser is normally appointed for a group of students by the Director of the Institute. The adviser advises each student about the academic program of that particular semester. However, it is also the student's responsibility to keep regular contact with his/her adviser who will review and eventually approve the student's specific plan of study and monitor subsequent progress of the student. The adviser is also authorized to permit the student to drop one or more courses based on his/her previous academic performance and corresponding categorization.

**Time Limit:**
How long a student shall be permitted to continue as a Bachelor's Degree candidate will be decided by the rules of the University.

## COURSE CURRICULUM FOR

### B. SC. (HONS.) IN INFORMATION TECHNOLOGY

| | | First Year First Semester | | |
|---|---|---|---|---|
| **SL** | **Course Code** | **Course Title** | **Credit Hrs** | **Class Hr/ Week** |
| 1 | IT 1101 | Information Technology Fundamentals | 3 | 3 hrs. |
| 2 | IT 1103 | Introduction to Programming Environment | 3 | 3 hrs. |
| 3 | IT 1105 | Electrical Circuits | 3 | 3 hrs. |
| 4 | IT 1107 | Differential and Integral Calculus | 3 | 3 hrs. |
| 5 | IT 1109 | Communicative English | 3 | 3 hrs. |
| 6 | IT 1104 | Structured Programming Language Lab | 1.5 | 3 hrs. |
| 7 | IT 1106 | Electrical Circuits Lab | 1.5 | 3 hrs. |
| 8 | IT 1100 | Viva | 0.5 | |
| | | Total Credit | 18.5 | |

| | | First Year Second Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| 1 | IT 1201 | Data Structures | 3 | 3 hrs. |
| 2 | IT 1203 | Object Oriented Programming | 3 | 3 hrs. |
| 3 | IT 1205 | Complex Variable and Vector Algebra | 3 | 3 hrs. |
| 4 | IT 1207 | Economics | 3 | 3 hrs. |
| 5 | IT 1209 | Accounting | 3 | 3 hrs. |
| 6 | IT 1202 | Data Structures Lab | 1.5 | 3 hrs. |
| 7 | IT 1204 | Object Oriented Programming Lab | 1.5 | 3 hrs. |
| 8 | IT 1200 | Viva | 0.5 | |
| | | Total Credit | 18.5 | |

| | | Second Year First Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| 1 | IT 2101 | Algorithm Analysis | 3 | 3 hrs. |
| 2 | IT 2103 | Computer Architecture | 3 | 3 hrs. |
| 3 | IT 2105 | Electronic Devices and Circuits | 3 | 3 hrs. |
| 4 | IT 2107 | Ordinary and Partial Differential Equation | 3 | 3 hrs. |
| 5 | IT 2109 | Statistical and Probability Theory | 3 | 3 hrs. |
| 6 | IT 2102 | Algorithm Analysis Lab | 1.5 | 3 hrs. |
| 7 | IT 2104 | Computer Architecture  Lab | 1.5 | 3 hrs. |
| 8 | IT 2106 | Electronic Devices and Circuits Lab | 1.5 | 6 hrs. |
| 9 | IT 2100 | Viva | 0.5 | |
| | | Total Credit | 20.0 | |

| | | Second Year Second Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| **1** | IT 2201 | Information System Analysis | 3 | 3 hrs. |
| **2** | IT 2203 | Digital Logic Design | 3 | 3 hrs. |
| **3** | IT 2205 | Data Communication | 3 | 3 hrs. |
| **4** | IT 2207 | Discrete Math | 3 | 3 hrs. |
| **5** | IT 2209 | Computational Mathematics | 3 | 3 hrs. |
| **6** | IT 2202 | Information System Analysis Lab | 1.5 | 3 hrs. |
| **7** | IT 2204 | DLD Lab | 1.5 | 3 hrs. |
| **8** | IT 2210 | Computational Mathematics Lab | 1.5 | 3 hrs. |
| **9** | IT 2200 | Special Study (Industrial Tour)  and Viva | 1 | |
| | | Total Credit | 20.5 | |

| | | Third Year First Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| **1** | IT 3101 | Database Management System | 3 | 3 hrs. |
| **2** | IT 3103 | Computer Network and Internet Technology | 3 | 3 hrs. |
| **3** | IT 3105 | Signal and System | 3 | 3 hrs. |
| **4** | IT 3107 | Operating System | 3 | 3 hrs. |
| **5** | IT 3109 | Simulation and Modeling | 3 | 3hrs |
| **6** | IT 3102 | Database Management System Lab | 1.5 | 3 hrs. |
| **7** | IT 3104 | Computer Network and Internet Technology Lab | 1.5 | 3 hrs. |
| **8** | IT 3106 | Signal and System Lab | 1.5 | 3 hrs. |
| **9** | IT 3100 | Viva | 0.5 | |
| | | Total Credit | 20.0 | |

| | | Third Year Second Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| **1** | IT 3201 | Software Engineering | 3 | 3 hrs. |
| **2** | IT 3203 | Computer Graphics | 3 | 3 hrs. |
| **3** | IT 3205 | Web Technologies | 3 | 3 hrs. |
| **4** | IT 3207 | Microprocessor and Interfacing | 3 | 3 hrs. |
| **5** | IT 3209 | Introduction to Bio-informatics | 3 | 3 hrs. |
| **6** | IT 3202 | Software Engineering Lab | 1.5 | 3 hrs. |
| **7** | IT 3204 | Computer Graphics Lab | 1.5 | 3 hrs. |
| **8** | IT 3206 | Web Programming Lab | 1.5 | 3 hrs. |
| **9** | IT 3208 | Microprocessor and Interfacing Lab | 1.5 | 3 hrs. |
| **10** | IT 3200 | Viva | 0.5 | |
| | | Total Credit | 21.5 | |

| | | Fourth Year First Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| **1** | IT 4101 | Artificial Intelligences & Neural Networks | 3 | 3 hrs. |
| **2** | IT 4103 | Telecommunication Systems | 3 | 3 hrs. |
| **3** | IT 4105 | Management Information System | 3 | 3 hrs. |
| **4** | IT 4107 | Parallel and Distributed System | 3 | 3 hrs. |
| **5** | IT 4109 | Multimedia Systems & Application | 3 | 3 hrs. |
| **6** | IT 4102 | Artificial Intelligences & Neural Networks Lab | 1.5 | 3 hrs. |
| **7** | IT4104 | Telecommunication Systems Lab | 1.5 | 3 hrs. |
| **8** | IT 4100 | Viva +Thesis/Project Proposal | 2.0 | |
| | | Total Credit | 20.0 | |

| | | Fourth Year Second Semester | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| **1** | IT 4201 | Human Computer Interfacing | 3 | 3 hrs. |
| **2** | IT 4203 | Wireless & Mobile Communication | 3 | 3 hrs. |
| **3** | IT 42XX | From Option-I | 3 | 3 hrs. |
| **4** | IT 42XX | From Option-II | 3 | 3 hrs. |
| **5** | IT 42XX | Option-I/Option II | 3 | 3 hrs. |
| **6** | IT 4299 | Thesis/Project | 3 | 6 hrs. |
| **7** | IT 4200 | Viva | 1 | |
| | | Total Credit | 19.0 | |

| | | Option I | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| 1 | IT 4221 | Embedded System Design | 3 | 3 hrs. |
| 2 | IT 4223 | Speech Processing and Speech Recognition | 3 | 3 hrs. |
| 3 | IT 4225 | Digital Image Processing and Pattern Recognition | 3 | 3 hrs. |
| 4 | IT 4227 | Mobile application development | 3 | 3 hrs. |
| 5 | IT 4229 | Neuroinformatics | 3 | 3 hrs. |
| 6 | IT 4231 | Object Oriented Software Engineering | 3 | 3 hrs. |

| | | Option II | | |
|---|---|---|---|---|
| **SL** | Course Code | Course Title | Credit Hrs | Class Hr/ Week |
| 1 | IT 4251 | Digital Communication Systems | 3 | 3 hrs. |
| 2 | IT 4253 | Digital Signal Processing | 3 | 3 hrs. |
| 3 | IT 4255 | E-commerce & E-governance | 3 | 3 hrs. |
| 4 | IT 4257 | Cryptography | 3 | 3 hrs. |
| 5 | IT 4259 | Computer Network Security | 3 | 3 hrs. |
| 6 | IT 4261 | Optical Fiber Communication | 3 | 3 hrs. |

# DETAIL SYLLABUS
## YEAR I: SEMESTER 1
## (TOTAL CREDIT: 18.5)

**IT 1101: Information Technology Fundamentals**
Introduction to computations: early history of computing devices; computers; major components of a computer; Hardware: processor, memory, I/O devices; software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; the Internet, Basic programming concepts: Number system: binary, octal, hexadecimal, decimal; binary arithmetic, program development stages, flow charts, programming constructs: data types, operators, expressions, statements, control statements, functions, array.
Introduction to IT: IT for telecom networks, IT applications, intelligent systems and E-commerce, Information Technology and systems, Information Security, Multimedia, Management Information System (MIS).
*Suggested Texts:*
1. Introduction to Information Technology, Pearson Edication, ITL Education Solutions Ltd.
2. Computer and Information Processing- William M. Fouri
3. Introduction to Computer- Peter Norton
4. Computers Today – Suresh K Basandra
5. Allen B.Tucker et.al, "Fundamentals of Computing I", TMH New Delhi.
6. V.Rajaraman, "Fundamentals of Computers", Prentice-Hall of India.
7. IT for management: Making connection for strategic Advantage.

**IT 1103: Introduction to Programming Environment**
History of Programming Languages; Programming Environment; Complier and Interpreter; Structural Programming concepts: Programming fundamentals, data types, operators, expressions, control structures; Functions and program structure, Header files; Preprocessor; Pointers and arrays; Strings, multidimensional array, User defined data types; Input and Output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics, Linking, library functions.
*Suggested Texts:*
1. Programming with C- Byron Gottfried (Schaum's Outline Series)
2. Herbert Schidt, "C Made Easy", McGraw Hill.
3. How to Program- Deitel / Deitel, C (Prentice Hall)
4. Problem solving and Progamming- Barclay, ANSI C (Prentice Hall)
5. Progamming in ANSI C- E Balagurusamy

**IT 1104: Structured Programming Lab**
Syllabus based on IT 1103

**IT 1105: Electrical Circuits**
Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchhoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, Wye-Delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including supernode and super mesh. Network theorems: Source transformation, Thevenin's, Norton's and Superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses.

*Suggested Texts:*
1. Millman and Halkias, "Electronic Devices and Circuits ", Tata McGraw Hill, 1991.
2. Edminister J.A, Electric Circuits, Schaum's series, McGraw Hill
3. Schilling D.L. & Belove C., Electronic Circuits: Discrete & Integrated, McGraw Hill.
4. Introductory Circuit Analysis, Robert L. Boylestad.
5. Schaum's Outline of Electric Circuits, Mahmood Nahvi

**IT 1106: Electrical Circuits Lab**
Syllabus based on IT 1105

**IT 1107: Differential and Integral Calculus**
Matrices: Introduction, Determination, Inverse of a matrix, Rank of a Matrix, Eigen value Problems. Differential Calculus: Limits, continuity and differentiablity; Successive differentiation of various types of functions; Leibnitz's Theorem; Roole's Theorem; Mean valueTheorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions; Evaluation of indeterminate forms by L'Hospitals rule; Patial differentiation; Euler's Theorem; Tangenet and Normal, Subtangent and subnormal in Cartesian and polar co-ordinates; Maximum and minimum values of functions of single variable.
Integral Calculus: Definitions of integration; Integration by the method of substitutions; Integration by parts; Standard integrals; Integration by the method of successive reduction; Definite integrals and its properties and use in summing series; Walli's formula, Improper integrals, Beta function and Gamma function; Area under a plane curve in Cartesian and polar co-ordinates; Trapezoidal rule, simpson's rule. arc lengths of curves in Cartesian and polar co-ordinates, parametric and pedal equations.
*Suggested Texts:*
1. Differential and Integral Calculus, Vol. 2 by Richard Courant, Edward James McShane and Sam Sloan
2. Schaum's Outline of Theory and Problems of Differential and Integral Calculus (Schaums Outline Series) by Frank Ayres and Elliott Mendelson
3. Calculus by Howard Anton, Irl C. Bivens and Stephen Davis
4. Differential and Integral Calculus by C. E. Love, E. D. Rainville - The MacMillan Company

**IT 1109: Communicative English**
LANGUAGE: imperative verbs- common past simple verbs - basic question forms and short answers- can for ability and possibility- like and would like - subject - verb - object word order- possessive pronouns and 's'- adverbs of frequency (sometimes, always)- like +ing- irregular past simple verbs- the present perfect simple with ever  - going to for future plans- Modal verbs: have to for obligation, should for advice, could / might / must / can't for possibility- too / (not) enough- subject questions (e.g. Who gave it to you?)- the present continuous for future arrangements- can / can't for permission- the present perfect simple and continuous with for and since- the first and second conditional- used to- so / neither- reported speech with say and tell the past continuous for unfulfilled promises (I was going to.. but..)- reported speech - statements, commands and questions, say vs. tell- tag questions- if only / I wish + past perfect- if and unless- verbs which can be transitive or intransitive- verb + (to) infinitive or –ing- defining relative clauses- could and be able to  - Modal and semi-modal verbs: could /might / will, needn't have and didn't need to, had better- used to and would- -ed and –ing adjectives (amazed / amazing)- make and let- be used to and get used to- would rather / prefer- look and look like, feel like – conditionals.
SPEAKING: ask and answer simple questions on familiar topics and about personal details- make and respond to simple statements- describe yourself, your family and where you live- describe your hobbies and interests in a simple way- make simple transactions in shops, post offices or banks- asking for basic information and buying tickets- ask for and give directions referring to a map or plan- make and accept apologies- ask for attention- show that you understand what's being said to you - discuss with others where to go and what to do and make arrangements- describe your educational background and your job- deal with most situations when making travel arrangements or travelling- express and respond to feelings

such as surprise, happiness, sadness, interest or indifference - give or seek personal opinions- agree or disagree with someone politely- narrate a story- give detailed accounts of experiences, describing feelings and reactions- describe dreams, hopes and ambitions- relate the plot of a book or film and describe your reactions.

READING: Reading comprehension - reading articles taken from the journals, newspapers –answering different types of questions based on comprehensions – helping in learning to read English texts easily and with full understanding

LISTENING: listening exercise to enhance the ability to understand announcements, lectures and other interactive messages in audio format

WRITING: learning how to compose an academic writing with proper development of the theme – how to develop ideas in an essay.

***Suggested Texts:***
1. Cliff's TOEFL(for practice of different skills)
2. Practical English Usage by Michael Swan
3. Barman, Binoy. Basic Language Skills Practice, Ed. M. Maniruzzaman. Dhaka: Friends' Book Corner, 2004.
4. Murphy, Raymond. Intermediate English Grammar. UK: Cambridge University Press, 1994.

## YEAR I: SEMESTER 2

## (TOTAL CREDIT: 18.5)

**IT 1201: Data Structures**
Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stacks, queues, trees, graphs; Advanced data Structures: heaps, Fibonacci heaps, B-trees; Recursion, sorting, searching, hashing, storage management.
***Suggested Texts:***
1. Data Structure and Algorithm- Schaum's Outline Series
2. Fundamentals of Data Structures- Horowitz E. and Sahni, S Galgotia
3. Data Structures and Program Design in C- Kruse/Tondo/Leung (Prentice-Hall)
4. Wirth N, Algorithms + Data Structures= Programs, Prentice Hall
5. Adam Drozdek, Data Structures and Algorithms in C++, Thomson Brooks/cole - Vikas Pub. House pvt. Ltd.
6. Deshpande P.S, Kakde O.G, C and Data Structures, Dream -tech India Pvt. Ltd.

**IT 1202: Data Structures Lab**
Syllabus based on IT 1201

**IT 1203 Object Oriented Programming**
Features of Object Oriented Languages, Procedural vs. Object Oriented, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Effects of OO Approach, Basic OO Design classes and encapsulation, constructors & destructors, Dynamic Memory Allocation, Pointers to Classes, I/O STREAM, overloading operators, constants, scope, & linkage, inheritance, polymorphism and dynamic binding, class and function templates.
***Suggested Texts:***
1. Head First Java, Kathy Sierra and Bert Bates, O'reilly publication
2. Object Oriented Programming with C++ - E. Balagurusamy
3. Java -The Complete Reference – Herbert Schildt
4. Programming in C++ by Balagurusamy TMH.
5. Complete JAVA reference by Patrick Naughton.
6. LearningObject oriented Programming with C++ and JAVA, D.Samantha Prentice-Hall ofIndia pvt ltd.

**IT 1204: Object Oriented Programming Lab**
Syllabus based on IT 1203

**IT 1205: Complex Variable and Vector Algebra**
**Vector Algebra:** Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products; Linear dependence and independence of vectors.
**Complex Variable**: Complex number system; General functions of a complex variable; Limits and continuity of a function of complex variable and related theorems; Complex differentiation and the Cauchy Riemann Equations; Mapping by elementary functions; Line integral of a complex function; Cauchy's Integral Theorem; Cauchy's Integral Formula; Liouville's Theorem; Taylor's Theorem and Laurent's Theorem. Singular points; Residue; Cauchy's Residue Theorem. Evaluation of residues; Contour integration; Conformal mapping.
***Suggested Texts:***
1. J. H. Mathews and R. W. Howell, "Complex Analysis for Mathematics and Engineering", 4th ed., Jones and Barlett,

2. Stewart and D. Tall, "Complex Analysis: (the hitchhiker's guide to the plane)", Cambridge University Press.
3. J. W. Brown and R. V. Churchill "Complex Variable and Applications", 7th ed., McGraw-Hill.
4. D. G. Zill, "A First Course in Differential Equations", Brooks Cole. M. R. Spiegel, "Schaum's Outline of Complex Variables", McGraw-Hill.

**IT 1207: Economics**

**Definition of Economics**; Economics and engineering; Principles of economics.

**Micro-Economics**: Introduction to various economic systems ? capitalist, command and mixed economy; Fundamental economic problems and the mechanism through which these problems are solved; Theory of demand and supply and their elasticities; Theory of consumer behavior; Cardinal and ordinal approaches of utility analysis; Price determination; Nature of an economic theory; Applicability of economic theories to the problems of developing countries; Indifference curve techniques; Theory of production, production function, types of productivity; Rational region of production of an engineering firm; Concepts of market and market structure; Cost analysis and cost function; Small scale production and large scale production; Optimization; Theory of distribution; Use of derivative in economics: maximization and minimization of economic functions, relationship among total, marginal and average concepts.

**Macro-economics**: Savings; investment, employment; National income analysis; Inflation; Monetary policy; Fiscal policy and trade policy with reference to Bangladesh; Economics of development and planning.

*Suggested Texts:*
1. Basic Economics (3rd Ed.)- Thomas Sowell
2. Economics in One Lesson- Henry Hazlitt
3. Economics For Dummies- Sean Masaki Flynn

**IT 1209: Accounting;**

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

**Financial statement analysis and interpretation:** ratio analysis.

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

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

*Suggested Texts:*
1. Accounting for Non-Accountants- Wayne Label
2. Basic Accounting Concepts, Principles and Procedures- Gregory R Mostyn
3. Schaum's Outline of Principles of Accounting- Joel Lernel & James Cashin

## YEAR II: SEMESTER 1

## (TOTAL CREDIT: 20.0)

**IT 2101: Algorithms Analysis**

Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

*Suggested Texts:*
1. Algorithms in C- Sedgewick, R (1990) (Addision Wesley)
2. Wirth N, Algorithms + Data Structures= Programs, Prentice Hall
3. Adam Drozdek, Data Structures and Algorithms in C++, Thomson Brooks/cole - Vikas Pub. House pvt. Ltd.
4. Intoductions to Algorithms- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Prentice-Hall, India

**IT 2102: Algorithms Analysis Lab**

Syllabus based on IT 2101

**IT 2103: Computer Architecture**

Instructions and data access methods; Arithmetic Logic Unit (ALU) design: arithmetic and logical operations, floating point operations; Processor design: data paths- single cycle and multi cycle implementations; Control Unit design: hardware and micro-programmed Pipeline- pipelined data path and control, hazards and exceptions. Memory organization: cache, virtual memory; Buses; Multiprocessors, type of multiprocessor performance, single bus multiprocessors, clusters. Information representation and transfer, instruction and data access methods, the control unit; hardware and micro-programmed; RISC and CISC machines.

*Suggested Texts:*
1. D. A. Patterson, J. L. Hennessy, P. J. Ashenden J. R. Larus and D. J. Sorin,"Computer Organization and Design: The Hardware/Software Interface",Morgan Kauffmann
2. Computer Architechture and Organization, Hayes, McGraw-Hill.

**IT 2104: Computer Architecture Lab**

Syllabus based on IT 2103

**IT 2105: Electronic Devices and Circuits**

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode.

Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, h parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier.

Field Effect Transistors (FET): principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS.

Operational Amplifiers (OPAMP): linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise.

Introduction to feedback, Oscillators, Silicon Controlled Rectifiers (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes

*Suggested Texts:*
1. S. Sedra and K. C. Smith, "Microelectronic Circuits", 5th ed., Oxford University Press, 2003.
2. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 8th Edition, Prentice-Hall, 2002.
3. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford University Press, 2008.

4. W. H. Hayt, J. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 6th ed., McGraw-Hill, 2002.
5. S. Sedra and K. C. Smith, "Microelectronic Circuits", 5th ed., Oxford University Press, 2003.
6. P. Malvino and J. A. Brown, "Digital Computer Electronics", 3rd ed., McGraw-Hill, 1992.
7. W. H. Hayt, J. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 6th ed., McGraw-Hill, 2002.

### IT 2106: Electronic Devices and Circuits
Syllabus based on IT 2105

### IT 2107: Ordinary and Partial differential Equations
Ordinary Differential Equation: Simultaneous first order linear equations with constant coefficients - Linear equations of second order with constant and variable coefficients, Homogeneous equation of Euler type, equations reducible to homogeneous form, Method of reduction of order - Method of variation of parameters.
Partial Differential Equations: Formation, Solutions of standard types of first order equations, Lagrange's Linear equation, Linear partial, differential equations of second and higher order with constant coefficients.
Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave.
Laplace Transforms: Definition; Laplace transforms of some elementary functions; Sufficient conditions for existence of Laplace transforms; Inverse Laplace transforms; Laplace transforms of derivatives. The unit step function; Periodic function; Some special theorems on Laplace transforms; Partial fraction; Solutions of differential equations by Laplace transforms; Evaluation of improper integrals.
*Suggested Texts:*
1. Calculus by James Stewart
2. Calculus by Frank Ayres, Elliott Mendelson
3. Schaum's Outline of Theory and Problems, Laplace Transforms by M.R. Spiegel
4. The Laplace Transform: Theory and Applications (Undergraduate Texts in Mathematics) by Joel L. Schiff
5. Complex Variables and the Laplace Transform for Engineers by Wilbur R. LePage
6. Differential Equations by Paul Blanchard, Robert L. Devaney, Glen R. Hall
7. Fourier Analysis by T. W. Körner
8. Partial Differential Equations By Lawrence C. Evans

### IT 2109: Statistics & Probability Theory
Elements of Statistics: Nature and scope of statistics, Nature & representation of statistical data; Attributes and variables; discrete and continuous variables; Method of data collection; Measures of location: Characteristics of an ideal measure; Arithmetic mean; Geometric mean; Harmonic mean; Median; Mode; Quartiles; Deciles; Percentiles.
Measure of dispersion: Characteristics of an ideal measure: Absolute & Relative measures; Range; Standard deviation; Mean deviation; Quartile deviation; Coefficient of dispersion; Coefficient of variation; Skewness and kurtosis.Elements of Probability: Meaning and definition of probability; A priori and a posteriori probability; Basic terminology of probability; Random variables; Probability function; Expectation of sum and products. Regression and correlation: Relationship between variables; Fitting of regression lines; Simple correlation; Multiple correlation and regression. Tests of Significance: Tests of means, Variance, Correlation coefficient and regression coefficient. Probability Distribution: Concept of Stochastic process, Binomial, Poisson, Normal & Exponential distribution; Discrete time Markov chain and continuous time Markov chain; Birth-death process in queuing; Queuing models: M/M/1, M/M/C, M/G/1, M/D/1, G/M/1; solution of network queues; Closed queuing models and approximate models.
*Suggested Texts:*
1. John E Freund, Mathematical Statistics, Prentice Hall of India
2. Johnson R.A, Miller & Freud's Probability & Statistics for Engineers, Pearson Education Asia
3. John E Freund, Mathematical Statistics, , Prentice Hall of India

## YEAR II: SEMESTER 2
## (TOTAL CREDIT: 20.5)

### IT 2201: Information System Analysis
Introduction: Systems Players, IS Building Blocks, IS Development, Systems Analysis, Context of Systems Analysis, Systems Analysis Methods, Requirements Discovery, Data Modeling, Process Modeling, Feasibility Analysis and Problem Proposal.
Systems Design: Design Phases, Different Design Strategies, Design towards Procuring a Commercial Systems Software Solution, Structure Charts, Structured Module Design, Application Architecture and Modeling, Database Design.
System Implementation and Maintenance: Implementation, Testing, System changeover, Maintenance, Methodologies and Case Tools, Software Engineering Paradigms, Development Methods, CASE Tools, Trends in Methodologies and Automated Development Tools.
Introduction to Formal Methods: Why Formal Methods?, Role of Specification, Specification Activities, Specification Quality, Abstraction, Formal Systems, Formal Specification Tools and Languages.
*Suggested Texts:*
1. Martin Fowler, Kendall Scott, "UML Distilled - Applying the standard object modeling language", Addison Wesley
2. Richard C Lee, William M Tepfenhart, "UML and C++ - A practical guide to object oriented development", PH
3. Grady Booch, "Object Oriented Analysis and Design with applications" II Edition Addison Wesley
4. James Martin & James J. Odell, "Object Oriented Methods - A foundation", Prentice Hall

### IT 2202: Information System Analysis Lab
Syllabus based on IT 2201

### IT 2203: Digital Logic Design
Different types of number systems, their representation, conversion and mathematical operation. Codes: BCD, alphanumeric, gray and excess-3. Digital logic: Boolean algebra, De Morgan's laws. Logic minimization. Logic gates and their truth tables. Basic logic gates in CMOS: DC characteristics, noise margin and power dissipation. Modular combinational circuit design: pass gates, multiplexer, de-multiplexer, encoder, decoder and comparators. Arithmetic logic circuit design: Half adder, full adder, half subtractor, full subtractor. Sequential circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: shift registers, counters and their applications. Synthesis of digital circuits using Hardware Description Language (HDL).
*Suggested Texts:*
1. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", McGraw-Hill, 2002.
   Suggested
2. Morris Mano, " Digital logic and Computer Design ", Prentice-Hall

### IT 2204: Digital Logic Design Lab
Syllabus based on IT 2203

**IT 2205: Data Communication**

Data communication networks: standards, ISO reference model, internal architecture, protocol implementation issues, transmission media, attenuation and distortion, limited bandwidth, signal types, propagation delay, public carrier circuits, modulation, multiplexing, physical layer interfacing standards

Data transmission basics: transmission modes, asynchronous and synchronous transmission, bit - character and frame synchronization, coding, error detection methods, parity, block sum check, cyclic redundancy check, data compression, Huffman coding, dynamic Huffman coding, facsimile compression, transmission control circuits, communication control devices

Protocol basics: error control, stop-and-wait & sliding window protocol, link utilization, selective repeat and go-back-N - link management

Frame relay and ATM networks: Frame relay operation, layers and traffic control; ATM networks, Architecture switching, layers service classes.

Local Area Network: LAN topology, Ethernet, Token bus, Token ring, FDDI, Wireless LAN, ATM LAN, IEEE 802 Medium access control layer standard, Random access protocols, ALOHA, Slotted ALOHA.

*Suggested Texts:*
1. William Stallings, Data and Computer Communications, PHI
2. Behrouz Forouzan, Introduction to data communication and networking, Tata McGraw Hill Publishing Company Ltd.
3. Halsall F., Data Communication, Computer Networks and Open Systems, Addison Wesley
4. Leon-Garcia A. & Widjaja I., Communication Networks, Tata McGraw Hill
5. Bertsekas & Gallagar, Data Networks, PHI

**IT 2206: Data Communication  Lab**

Syllabus based on IT 2205

**IT 2207 Discrete Mathematics**

Set theory: Introduction, Set & its Elements, Set Description, Types of sets, Venn & Euler Diagrams, Set operations & Laws of set theory, Fundamental products, partitions of sets, minsets, Algebra of sets and Duality, Inclusion and Exclusion principle.

Mathematical logic: Introduction, prepositional calculus, basic logical operations, Tautologies, Contradiction, Argument, Mathematical Reasoning, Method of proof, Counting, Predicate calculus.

Relations: Binary Relations, Set operation on relations, Types of Relations, Partial order relation, Equivalence relation, Composition of relations, Functions, Composition of functions.

Graph Theory: Basic terminology, paths, cycle & Connectivity, Sub graphs, Types of graphs, Representation of graphs in computer memory, Trees, Properties of trees, Binary trees, Tree traversing, Spanning Trees, Computer Representation of general trees. Planner Graph, Graph Coloring

*Suggested Texts:*
1. Kenith H. Rosen, Discrete Mathematics and Applications
2. Knuth, Concrete Mathematics
3. Nicodemi O CBS, Discrete Mathematics

**IT 2209: Computational Mathematics**

Computer Arithmetic: floating point representation of numbers, arithmetic operations with normalized floating point numbers; Iterative methods: different iterative methods for finding the roots of an equation and their computer implementation; Solution of simultaneous Algebraic Equations, Gauss elimination;

Interpolation, Least square approximation of functions, Taylor series representation, Chebyshev series; Numerical differentiation and integration and Numerical Solution of Differential Equations.

*Suggested Texts:*
1. S. B. Rao and C. K. Shantha,"Numerical Methods", Vantage Press
2. P. Balagurusamy and Techmadia,"Numerical Methods".

**IT 2210: Computational Mathematics Lab**

Syllabus based on IT 2209

## YEAR III: SEMESTER 1
## (TOTAL CREDIT: 21.5)

**IT 3101: Database Management System**
Introduction to concepts and methods for storing and manipulating data in stored form. File retrieval and organisation. Database models and designing of database systems. The principles of database management systems. Relational database management systems. Query formulation and language. Database administration. Methods used for the storage, selection and presentation of Data. Database integrity and security. Database design: functional dependencies - normal forms - general definition of second and third normal forms - Boyce-Codd normal form - multi valued dependencies and fourth normal form - join dependencies and fifth normal form - inclusion dependencies - practical database design tuning - database design process relational model concepts - relational algebra operations - queries in SQL - insert - delete and update statements in SQL views in SQL

*Suggested Texts:*
1. Silberschatz A., Korth H.F. & Sudarshan S., "Database System Concepts", Tata McGraw Hill
2. Elmasri & Navathe, "Fundamentals of Database Systems", Addison Wesley
3. Ramakrishnan R. & Gehrke J., "Database Management Systems", McGraw Hill
4. O'neil P. & O'neil E., "Database Principles, Programming, And Performance", Harcourt Asia, Morgan Kaufman.

**IT 3102: Database Management System Lab**
Syllabus based on IT 3101

**IT 3103: Computer Network & Internet Technologies**
Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.11; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithm; Congestion control; Internetworking, WAN; Fragmentation; Firewalls; IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures; Gigabit Ethernet; Domain Name System: Name servers; Email and its privacy; SNMP; HTTP; World Wide Web. Internetworking Server and Services: Server Implementation, Content Servers, Performance Servers, Database Servers, Mirrored Servers, Popular Server Products, Web Servers & Databases; Evolution of the World Wide Web, Web Browser Software, Using Browsers to Access Web Pages, Customizing your Browser, Images & Web Browsers, Wireless Web Protocols; Electronic Mail.

*Suggested Texts:*
1. William Stallings, Data and Computer Communications, PHI
2. Prakash C Gupta, Data Communications, PHI
3. Behrouz Forouzan, Introduction to data communication and networking, Tata McGraw Hill Publishing Company Ltd.
4. Peterson L.L. &Davie B.S., Computer Networks, A systems approach, Harcourt Asia
5. Andrew S. Tanenbaum, Computer Networks, PHI

**IT 3104: Computer Network & Internet Technologies Lab**
Syllabus based on IT 3103

**IT 3105: Signals and Systems**

Concept of signals, classifications of signals like continuous time, discrete time, even and odd signals, analog and digital signal, periodic and non periodic signal, deterministic and random signal, energy signal and power signal; some special types of signals like exponential, sinusoidal, impulse, unit step, ramp; time shifting , scaling, reflection of signal.

Concept of systems, properties of systems, memoryless system, invertibility, causality, linearity, moving average system, stability; linear time-invariant (LTI) systems: introduction, convolution, impulse response representation for LTI systems, properties of the impulse response representation for LTI systems; continuous time Fourier series and transform, discrete time Fourier transform and its properties, STFT, wavelet transform, z-transform: introduction, properties of the region of convergence; properties of the z-transform; inversion of the z-transform, transform analysis of LTI systems, FIR and IIR filters; random variable and random process with their applications.

*Suggested Texts:*
1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid, S. Hamid Nawab,"Signals and Systems", Prentice Hall
2. Simon Haykin, Signals and Systems

**IT 3106: Signals and Systems Lab**
Syllabus based on IT 3105

**IT 3107: Operating System**
Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: hardware, software, disk, terminals, clocks; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; Case study of some operating systems.
Operating System: its role in computer system; Operating System concepts; Operating System structure; Process Management: Processes; Interprocess Communication ; Classical IPC Problems; CPU Scheduling; Process Synchronization; Deadlock; Storage Management: Memory Management; Virtual Memory; File-System ; Input/Output: Principle of I/O Hardware; Principle of I/O Software.

*Suggested Texts:*
1. Silberschatz, Galvin, Gagne—Operating System Concepts, John Wiley & Songs, Inc.
2. Andrew S. Tanenbaum, Albert S. Woodhull --- Operating System: Design and Implementation, Prentice-Hall India.
3. Nutt G. J., Operating Systems-A Modern Perspective, Pearson Education Asia
4. Crowley C., Operating Systems- A Design Oriented Approach, Tata McGraw Hill
5. William Stallings---Operating Systems: Internals and Design principles

**IT 3108: Operating System Lab**
Syllabus based on IT 3107

**IT 3109: Simulation and Modeling**
Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variates; Output analysis. Simulation languages: Analysis and modeling of some practical systems.

*Suggested Books:*
1. Modelling and Simulation, Giuseppe Petrone, Giuliano Cammarata – InTech
2. Simulating Humans: Computer Graphics Animation and Control, N. I. Badler, C. B. Phillips, B. L. Webber - Oxford University Press

# YEAR III: SEMESTER 2
## (TOTAL CREDIT: 21.5)

**IT 3201: Software Engineering**

Software engineering principles, life cycle models, sizing, estimation, planning, and control, requirements specifications, functional specification and design, integration and testing strategies, quality assurance, configuration management, software maintenance.

Management of programming teams, programming methodologies, debugging aids, documentation and measurement of sotware verification and testing techniques and the problems of maintenance, modification and portability.Introduction to object oriented software engineering.

*Suggested Texts:*
1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli; Fundamentals of Software Engineering; 2$^{nd}$ edition; Pearson Education Asia
2. Pressman R.S.; Software engineering - A practitioner's approach; 5$^{th}$ edition; McGraw Hill Higher education series.
3. Mall R.; Fundamentals of Software Engineering; Prentice Hall of India
4. Behferooz A. & Gydsib F.J.; Software Engineering fundamentals; Oxford University Press.
5. Jalote P.; An Integrated approach to Software Engineering; Narosa
6. Ian Sommervillie; Software Engineering, Pearson Education Asia

**IT 3202: Software Engineering Lab**

Syllabus based on IT 3201

**IT 3203: Computer Graphics**

Introduction to Graphical data processing. Fundamentals of interactive graphics Architecture of display devices and connectivity to a computer. Implementation of graphics concepts of two dimensional and three dimensional viewing, clipping and transformations. Hidden line algorithms. Raster graphics concepts: Architecture, algorithms and other image synthesis methods. Design of interactive graphic conversations

*Suggested Books*
1. William M., Newman,"Principles of Interactive Computer Graphics", McGraw-Hill.
2. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes,"Computer Graphics: Principle and Practice in C", Addison-Wesley.

**IT 3204: Computer Graphics Lab**

Syllabus based on IT 3203

**IT 3205: Web Technologies**

**Information and Distributed Systems Infrastructure:** Basic Terminology, Networks, Internet, Intranet and Extranet, Client/Server Computing Paradigm, Open Systems and Communication Protocols, Middleware: Views, Definitions, Functions, Client/Server Working Mechanism: Application Programming Interface (API), Sockets, Client and Server Implementation.

**Web and Programming:** Web Elements: Browser and Web Document. Static, Active and Dynamic pages, Programming paradigms and Web programming. Object-oriented vs. Object-based programming,

What should and should not be programmed on the Web, Tasks suitable for programming on the Web, Choice of programming language for Web programming.

**Client-side Programming:** JavaScript for Web Programming: Introduction to the Language, JavaScript: Object Hierarchy and working with objects, JavaScript: Event-Driven Programming,

**Server-side Programming:** Approaches to running Server Programs, The Classic Technology: Common Gateway Interface (CGI): Definition, Characteristics, CGI Programming Mechanism: GET and POST methods, Simple examples using Perl, Introduction to PHP Programming Language. PHP for Web Programming

*Suggested Books:*
1. A. Berson: Client/Server Architecture, 2$^{nd}$ ed., McGraw-Hill Series on Computer Communication.
2. Chris Bates: Web Programming. Building Internet Applications, 2$^{nd}$ ed., John Wiley & Sons, Ltd., 2002.
3. Douglas E. Comer: Computer Networks and Internets with Internet Applications, 3$^{rd}$ ed., Prentice Hall International, Inc., 2001.

**IT 3206: Web Programming Lab**

Syllabus based on IT 3205

**IT 3207: Microprocessor and Interfacing**

Introduction to microprocessors; Intel 8086 microprocessor: Architecture, addressing modes, instruction sets, assembly language programming, Memory Devices and Memory internal organization, Memory read and write timing diagrams, DRAM Controller; Basic I/O Interfacing: Parallel I/O, Programmed I/O, I/O port address decoding, The 8255A Programmable Peripheral Interface (PPI), programming 8255, Operation modes, Interface examples – Keyboard matrix, LCD/7-Segment Display, Printer, stepper motor, A/D and D/A converter; Timer Interfacing :The 8254 Programmable Interval Timer (PIT), Timing applications; Serial I/O Interface: Asynchronous communication, Physical communication standard-EIA RS232, Programmable Communication Interface - UART 8251, Interfacing serial I/O devices- mouse, modem, PC Keyboard; Interrupts :Interrupt driven I/O, Software & Hardware interrupts, Interrupt vectors and vector table, Interrupt processing, The 8259A Programmable Interrupt Controller (PIC)- cascading of 8259s, programming 8259, DMA; The 8237 DMA Controller,

*Suggested Books:*
1. An Introduction to the Intel Family of Microprocessors James L. Antonakos . Prentice Hall, 3ed Edition, 1999

2. Microprocessor architecture programming and applications, Gaonkar, 3$^{rd}$ edition.

**IT 3208: Microprocessor and Interfacing Lab**

Laboratory Works based on IT 3207

**IT 3209: Introduction to Bio-informatics**

Introduction to bioinformatics, classification of biological databases, Biological data formats, application of bioinformatics in various fields. Introduction to single letter code of amino acids, symbols used in nucleotides, data retrieval – Entrez and SRS.

Information networks: Internet – facilities used in the internet web browsers STTP 5, HTTP, HTML, URL – European molecular biology network – national centre for bio- technology information.

Bioinformatics databases: Introduction, Nucleotide sequence databases, Protein sequence databases.

Protein information resources: Biological data basics – primary secondary data basics – protein pattern data basics – DNA sequences data basics - DNA analysis  - Genes structure and DNA sequences – interpretation of EST structures – different approach to EST analysis.
Alignment techniques: Database searching  - comparison of two sequences – identity and   similarity – local and global similarity – global and local alignment  - multiple sequence alignment – data basis of multiple alignment – secondary data base.

***Suggested Books*:**
1. Shanmughavel, P. 2005. Principles of Bioinformatics, Pointer Publishers, Jaipur, India.
2. Bioinformatics For Dummies, 2nd Edition, Jean-Michel Claverie, Cedric Notredame.
3. T.K. Attwood and D.J Perry – Smith, Introduction to Bio-Informatics, Long man.
4. Coiera E, Guide to medical informatics, The internet and telemedicine, Chajsman & Hall medical, London.
5. Bernser, E.S. Clinical decision support systems, Theory and practice, Springer- Verlag, New York.

## YEAR IV: SEMESTER 1
## (TOTAL CREDIT: 19.5)

**IT 4101: Artificial Intelligences & Neural Networks**

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.
Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Greedy best first search, A* search Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search.
Knowledge Representation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in proposional logic, Resolution, Forward & Backward. Chaining.
First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Fuzzy logic
Biological nervous system: the brain and neurons; Artificial neural networks; Historical backgrounds. Hebbian ass octat or. Perceptrons: learning rule. illustration, proof. failing. Adaptive Linear (ADALINEj and Multiple Adaptive Linear (MADALINE) networks. Multilayer perceptrons: generating internal representation. Backpropagation, cascade correlation and counterpropagation networks. Higher order and bidirectional associated memory. Hopfield networks: Lyapunov energy  function. attraction basin. Probabilistic updates: Simulated annealing. Boltzman  machine. Adaptive Resonance Theory (ART) network. ART1, ART2. Fuzzy ART mapping (ARTMAP) networks. Kohonen's feature map, Learning Vector Quantization (LVQ) networks. Applications of neural nets.

***Suggested Books*:**

1. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/ Pearson Education.
2. Artificial Neural Networks B. YagnaNarayana, PHI
3.. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
4.. Artificial Intelligence and Expert Systems – Patterson PHI.
5. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
6.Neural Networks Simon Haykin PHI
7. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition.

**IT 4102: Artificial Intelligences & Neural Networks Lab**

Laboratory Works based on IT 4101

**IT 4103: Telecommunication System Fundamentals**
Introduction to Telecommunications: Beginning of Telecommunications, Evolution of Telecommunications, Telecommunications legislative history, Telecommunications PSTN Technology.
Basic Telecom Principles: Signals-Analog and Digital; Bandwidth – narrowband, wideband; Telecommunication Systems, Line System Characteristics, Radio System Characteristics, and Switching System Principles. Waveforms and filters, Voice frequencies, Attenuation and noise, Analog Modulation and Pulse Modulation
Telephone Systems and Cabling: From stand-alone to connect telephones; PBS; PBX, Centrex.
Switching and Signaling: Step-by-step telephone exchanges, Reed relay and crossbar exchanges, EMD exchange, Stored program control, Signaling, Digital exchanges.
Cable, Radio and Transmission: Local distribution networks, Carrier working: Groups and super groups, Submarine cables, Optic fibers, Radio propagation, Antennas, Satellites, Mobile Radio Systems.

Telecommunication Systems: Public Switched Telecommunication System (PSTN), Mobile Communication System, Cellular and Wireless Communication System.

Traffic Theory: The Erlang, Erlang's lost call formula, Queuing systems.

***Suggested Texts:***
1. Fundamentals of Telecommunications-R. L. Freeman,
2. G. K. Mithal, "Radio Engineering".
3. W. Fraser, "Telecommunications"
4. Sanjeeva Gupta, "Electronic Communications".
5. B.P. Lathi, Modern digital and analog telecommunication systems–third edition, New York, NY: Oxford University Press
6. Fundamentals Of Fibre Optics In Telecommunication And Sensor Systems- Bishnu P. Pal

**IT 4104: Telecommunication System Fundamentals Lab**

Laboratory Works based on IT 4105

**IT 4105: Management Information System**

Nature of information systems: nature & type, key characteristics; Nature of organization: nature & type, key characteristics; Two way relationship between is and organization: IS's influence on organization, organization's influence on IS; Introduction to e-business, e-business transformation: models, opportunities and challenges; Defining the organization's need for IS: determining the information need, drawing up a IS plan, IS design alternative, in-house development vs. outsourcing, Enterprise system vs. Functional modules, system lifecycle vs. other methodologies, automation, process improvement, BPR vs. paradigm shift;

Cost, benefit, nature of IS investment: determining the cost and benefit of IS, determining the Risk factors, business value of IS investment;

Managing the transformation: change management issues, prerequisites for successful change management. Social, Political, and Ethical Issues in the Information Age, Computer Hardware, Computer Software, Managing Data Resources, Telecommunications and Networks, Systems Development, Information Systems Quality, Security, and Control, Decision Support Systems, Artificial Intelligence.

***Suggested Books:***
1. "Management Information System: Managing the Digital Firm" , by Kenneth C. Laudon, Jane P. Laudon, Prentice Hall.
2. "Management Information System", by Raymond McLeod, Jr. and George Schell, Prentice Hall.
3. "Management Information Systems" by James A. O'Brien, George Marakas, McGraw-Hill/Irwin.
4. "Introduction to Information Systems Project Management", by David L. Olson, David Olson, McGraw-Hill/Irwin.
5. "Management Information Systems for the Information Age with CDROM" by Stephen Haag, Maeve Cummings, Irwin/McGraw-Hill.

**IT 4107: Parallel & Distributed Systems**

Introduction: Why use parallel and distributed systems? Why not use them?, Speedup and Amdahl's Law, Hardware architectures: multiprocessors (shared memory), networks of workstations (distributed memory), clusters, Software architectures: threads and shared memory, processes and message passing, distributed shared memory (DSM), distributed shared data (DSD).

Parallel Algorithms: Concurrency and synchronization, Data and work partitioning, Common parallelization strategies, Granularity, Load balancing, Examples: parallel search, parallel sorting, etc.

Distributed Systems: System Architecture, Communicatio, Mid-session Recess, Replication & Consistency, Distributed Shared Memory, Synchronisation & Coordination, Middleware, Fault Tolerance , Security, Naming, Distributed File Systems.

Shared-Memory Programming: Threads, Pthreads, Locks and semaphores

Distributed-Memory Programming: Message Passing, MPI, PVM

Other Parallel Programming Systems: TreadMarks: Distributed shared memory, Aurora: Scoped behaviour and abstract data types, Enterprise: Process templates, Protocols for DSM systems, Impact of network protocols (TCP/IP, UDP/IP, bulk-data transfer, etc.), System area networks (SAN) (e.g., Myrinet).

***Suggested Books:***
1. B. Wilkinson and M. Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, Prentice Hall.
2. Andrew S. Tanenbaum & Maarten van Steen: Distributed Systems: Principles and Paradigms, Pearson Prentice Hall.
3. George Coulouris, Jean Dollimore & Tim Kindberg: Distributed Systems: Concepts and Design, Addison-Wesley.
4. Pradeep K. Sinha: Distributed Operating Systems, IEEE Press.

**IT 4109: Multimedia Systems & Applications**

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

***Suggested Books:***
1. Multimedia Database Management Systems by B. Prabhakaran, Kluwer Academic Publishers.
2. Multimedia Systems by Ralf Steinmetz and Klara Nahrstedt ,Kindle Book.
3. B. Furht, S.W. Smoliar, H.J. Zhang, Video and Image Processing in Multimedia Systems, Kluwer, Boston.
4. J.K. Wu, M.S. Kankanhalli, J.H. Lim, D.Z. Hong, Perspectives on Content-based Multimedia Systems, Kluwer Academic Publishers, Boston.

# YEAR IV: SEMESTER 8
# (TOTAL CREDIT: 21.0)

**IT 4201: Human Computer Interfacing**

Introduction: The human; The computer; The interaction; Paradigms; Design basics: Interaction design basics; HCI in the software process; Design rules; Implementation support; Evaluation techniques; Universal design; User support; Models and Theories: Cognitive models; Socio-organizational issues and stakeholder requirements; Communication and collaboration models; Task analysis; Dialogue notations and design; Models of the system; Modelling; rich interaction; Groupware; Ubiquitous computing and augmented realities; Hypertext, multimedia, and the world wide web.

*Suggested Books:*
1. A. Dix, J. Finlay, G. Abowd and R. Beale. Human Computer Interaction, Third Edition, Prentice Hall.
2. Picard, R. (2000) Towards computers that recognize and respond to emotion, IBM System Journal, Vol. 39, 705-719
3. Shneiderman, B. (1998) Designing the user Interface, third edition, Adison-Wesley Publishing Company, New York
4. Preece, J. (1998) Emphatic Communities: Reaching Out Across the Web, Interactions, Vol 2, 32-43
5. Laurel, B. (1991) The Art of Human-Computer Interface Design, (edited volume) Adison-Wesley Publishing Company, New York

**IT 4203: Wireless & Mobile Communication**

Introduction: Concept, evolution and fundamentals of cellular telephony, mobile system architecture, design, performance and operation, antenna at cell site and mobile antenna. Radio wave propagation: Propagation characteristics, EIRP, models for radio propagation, Fresnel zone, reflection, diffraction, scattering, fading, modeling of multipath channel. Cellular radio system: Concept of cell and cell cluster, improving the capacity of a system, frequency reuse, cell splitting and sectoring, co-site, co-channel and adjacent channel interferences, Hand off and dropped calls, frequency allocation techniques, concept of BTS, BSC and MSC, roaming, planning of mobile cellular networks. Digital mobile communication standards: GSM, GPRS, EDGE, CDMA, 3G, Wi-Fi, WiMAX and 4G systems, mobile IP and VoIP, wireless sensor networks.

*Suggested Books:*
1. "Wireless Communication and Networks" by William Stallings.
2. "Wireless and Mobile Network Architectures" by Yi-Bing Lin and Imrich chlamtac

## Detailed Syllabus for Option- I

**IT 4221 Embedded System Design**

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded Systems Overview; Design Challenge; Processor Technology; IC Technology; Design Technology; Trade-Offs. CUSTOM SINGLE PURPOSE PROCESSORS: Combinational Logic; Sequential Logic; Custom Single Purpose Processor Design; Rt-Level Custom Single Purpose Processor Design; Optimizing Custom Single Purpose Processors. GENERAL PURPOSE PROCESSORS: Basic Architecture; Operation; Programmer's View; Development Environment; ASIPs; Selecting a Microprocessor; General Purpose Processor Design STANDARD SINGLE-PURPOSE PROCESSORS: Timers, counters And Watchdog Timer; UART; Pulse Width Modulators; LCD Controllers; Keypad Controllers; Stepper Motor Controllers; Analog to Digital Converters; Real Time Clock. MEMORY: Memory Write Ability and Storage Permanence; Common Memory Types; Composing Memory; Memory Hierarchy and Cache; Advanced RAM. INTERFACING: Communication Basics; Microprocessor Interfacing: I/O Addressing; Microprocessor Interfacing: Interrupts; Microprocessor Interfacing: Direct Memory Access; Arbitration; Multilevel Bus Architecture; Advance Communication Principles; Serial Protocols; Parallel Protocols; Wireless Protocols. INTRODUCTION TO REAL TIME OPERATING SYSTEMS: Tasks and Task States; Tasks and Data; Semaphores and Shared Data.

*Suggested Books:*
1. Peckol, James, *Embedded Systems: A Contemporary Design Tool,* John Wiley and Sons, 2008, ISBN-13: 978-0471721802
2. Ball, Stuart, *Analog Interfacing to Embedded Microprocessor Systems, 2nd Edition*, Newnes, 2004, ISBN-13: 978-0750677233
3. Prinz, Peter & Crawford, Tony, *C In a Nutshell*, O'Reilly Media, Inc, 2006, ISBN-13: 978-0596006976
4. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid / Tony Givargis, 2006 reprint, John Wiley Student Edition.
5. An Embedded Software Primer, David .E. Simon, Fourth Impression 2007, Pearson Education.
6. Embedded Systems, Raj Kamal, 13th reprint 2007, Tata-McGrawHill Publications.
7. Embedded Microcomputer Systems, Valvano, Thomson.

**IT 4223: Speech Processing and Speech Recognition**

Introduction to Speech Signal: production, Perception and Characterization; Speech production models: Acoustic theory of speech production, discrete-time speech model, lossless model of the vocal tract; Signal Processing and Analysis; Speech perception, digital processing of speech signals; Short-term processing of speech, linear prediction analysis, spectral analysis; Speech coding: LPC, MRA, enhancement, human auditory system, Pattern Comparison Techniques: Distortion Measures, Spectral Distortion Measures, Time Alignment and Normalization; Recognition System Design and Implementation: Source Coding, Template Training, Performance Analysis; Continuous Speech Recognition: Sub-word Units, Statistical Modeling, Context Dependent Units; Task oriented Models. Quality assessment, speech synthesis; Speaker recognition and verification systems.

*Suggested Books:*
1. *Fundamentals of Speech Recognition- Lawrence Rabinere, Biing-Hwang Jung*
2. *Speech Recognition and Processing- John F. Buydos*
3. *Statistical Methods for Speech Recognition- Frederick Jelinek*

4. *Computer Speech: Recognition, Compression- Manfred, Robert Schroeder*

## IT 4225: Digital Image Processing and Pattern Recognition

Digital Image Fundamentals : Digital image-applicaitons of digital image processing-elements of digital image processing system-vidicon camera-line scan CCD sensor-area sensor-flash A/D converter-display-elements of visual perception-structure of the human eye-luminance-brightness-contrast-mach band effect-image fidelity criteria-colour models-RGB, CMY, HIS mathematical preliminaries of 2D systems-convolution-Fourier transform-ZS transform-toeplitz and circulant matrices-orthogonal and unitary matrices.

Image Transform : Properties of unitary transform-2D DFT-DCT-DST-Discrete wavelet transform-Discrete Hadamard-Walsh-Hotelling transform-Hotelling transform-SVD transform-Slant, Haar transforms.

Image Enhancement And Restoration: Contrast stretching-intensity level slicing-Histogram equalization-spatial averaging-directional smoothing-Median filtering-non linear filters-maximum, minimum, geometric mean, Harmonic mean contra-harmonic mean, Lp mean filters-edge detection-Roberts, Sobel, Isotropic, Kinsch, Campass gradient, Laplacian operators-Degradation model-unconstrained and constrained restoration-inverse filtering-removal of blur caused by uniform linear motion-Wiener filtering-geometric transformations for image restoration.

Image Compression : Huffman coding-truncated Huffman coding-B2, binary codes, artihmetic coding-bit plane coding-contrast area coding-Run length encoding-transform coding JPEG and MPEG coding schemes.

Image Segmentation: Pixel based approach-feature threshold-choice of feature-optimum threshold-threshold selection methods-region based approach-region growing-region splitting-region merging, split and merge.

Pattern Recondition : Introduction to Formal Languages, String Languages for Pattern Description. Higher Dimensional Pattern Grammars, Syntax Analysis as a Recognition Procedure. Stochastic Languages, Erro-Correcting Parsing for String Languages, Error-Correcting Tree Automata, Cluster Analysis for Syntactic Patterns, Grammatical Inference for Syntactic Pattern recognition, Application Shape Analysis of Wave Forms and Contours, Syntactic Approach to Texture Analysis.

***Suggested Books***:

1. Gonzalez, R. C and Woods, R.E, Digital image processing Addition-Wesley, 2000.
2. Anil.K.Jain Fundamentals of digital image processing, PHI, 1997.
3. Umbaugh, S.E. Computer vision and image processing, Prentice Hall International, Inc, 1998.
4. William. K. Pratt, Digital image processing. Wiley Interscience, 2000.

## IT 4227: Mobile application Developments

Mobile (Cellular) Telephony, Categories of Mobile Apps, Mobile Application Development: software architecture, application models, user interfaces, data storage, networking, specialized instruments (accelerometers, GPS, etc.) , specific devices , operating platforms , development environments . Selling a Mobile App

***Suggested Books***:

1. mConway and Hillegass, iOS Programming, Big Nerd Ranch
2. Deitel, Deitel, Deitel, Kern and Morgano, iPhone for Programmers, Prentice Hall.
3. Guy Hart-Davis, How to Do Everything iPod, iPhone & iTunes.

## IT 4229: Neuroinformatics

Introduction: overview of neuroinformatics challenges and opportunities. List of suitable final projects and presentation template.

Neuronal reconstructions I: from image stacks to digital vector traces. ImageJ, Neuron_Morpho plug-in, Neuromantic, V3D, Neuronland, CVAPP. Homework assignment: begin tracing example data set. Neuronal reconstructions II: morphometric analysis and data mining. NeuroMorpho.Org, L-Measure, neuroConstruct. Homework assignment: Complete tracing example data set and extract normalized Sholl-like plots, Electrophysiology and biophysics I: Compartmental simulations. NEURON, ModelDB.

Homework assignment: spike propagation and synaptic integration in the reconstructed data set, Electrophysiology and biophysics

***Suggested Books***:

1. Neuroinformatics (Methods in Molecular Biology) by Chiquito J. Crasto and S.H. Koslow
2. Neuroinformatics by Ronald Cohn Jesse Russell

## IT 4231: Object Oriented Software Engineering

Software Engineering: Software related problems, software engineering, concepts, development activities; Modeling: Concepts, Modeling with UML

Project Organization & Communication: Project Organization & communication concepts and their activities

Requirements: Requirements elicitation & its activities and managing requirements elicitation

Analysis: Analysis overview, concepts, activities and managing analysis

System Design: Design overview, concepts, and activities, addressing design goals and managing system design

Object Design: Object reuse, its activities & managing reuse, Interface specification concepts & its activities and Managing object design

Testing: Testing concepts, activities and managing testing

Software Configuration Management: Configuration Management overview, concepts, activities and managing configuration management

***Suggested Books:***

1. *Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia*
2. *Object-Oriented Software Engineering: Practical software development using UML and Java Timothy C. Lethbridge and Robert Laganiere , McGraw-Hill Higher education*
3. *An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata* McGraw-Hill

## Detailed Syllabus for Option- II

### IT 4251: Digital Communication Systems

Overview of different types of communication networks and their architecture; A/D conversion; GIF, JPEG, PNG; Audio coding for fixed telephone network and speech coding for mobile communications; Image and video codng; JPEG and MPEG; Channel coding: scrambling, convolution coding, cyclic redundancy checks, scrambling and interleaving; Modulation schemes: ASK, PSK, FSK, and GMSK modulation for local access: ADSL, DSL; Multiple access technologies, high speed PSTN access technology; Routing strategies, numbering schemes, Switching techniques: space switching, store and forward switching; Routing strategies; Numbering schemes; VSAT and satellite communication; Audio and video conferencing technique, Cable and satellite TV networks, HDTV transmission.

*Suggested Books***:**
1. *Digital Communications (3rd Ed) – John R Barry, Edward A Lee, David G Messer Schmitt*
2. *Digital Communications: Fundamentals and Applications- John Prokais*
3. *Schaum's Outline of Introduction to Digital System- Schaum's Series*

### IT 4253: Digital Signal Processing

Introduction to Digital Signal Processing (DSP): Introduction; Digital Signal Processing; Sampling and Analog-to-Digital Conversion; Discrete Time Signals; Ambiguity in Digital signals; Discrete Time Systems; Application areas for DSP; Key DSP operations: Convolution, Correlation, Digital Filtering, Discrete Transformation, Modulation;
System Design: Methodology & Implementation Methodology; Motivation.
The Z-Transform :Introduction to z-Transform; General Results of z-transform; Inverse z-Transform: Inspection Method, Partial Fraction Expansion, Power Series Expansion, Contour Integration; Comparison of inverse z-transform method; Properties of z-transform; Complex Convolution Theorem and Parseval's Relation.
Implementation of Discrete-Time Systems: Introduction; Block Diagram and Signal Flow Graph Representation of Digital Networks; Matrix Representation of Digital Networks;
Basic Structures of IIR Systems: Direct Form, Cascade forms, Parallel Form; Transposed Forms; Basic Structures of FIR Systems; Finite Precision Effects; Tellegen's Theorem for Digital Filters and Its Applications.
Design of Digital Filters: Introduction to Digital Filters; Types of Digital Filters: FIR and IIR; Choosing between FIR and IIR Filters: Digital Filter Design Steps; Design of FIR Filters: Design of FIR Filters by Windowing, Design of Optimum Equiripple Linear-Phase FIR Filters Design of IIR Filters: Classical Continuous-Time Low-Pass Filter Approximations, Conversion of Transfer Functions from Continuous to Discrete Time, Frequency Transformations of Low pass Filters.

*Suggested Books***:**
1. Proakis & Manolalus, Digital Signal Processing, Principles, Algorithm & Applications, Prentice Hall
2. Oppenheim & Schafer, Discrete Time Signal Processing, Prentice Hall
3. Ludeman L.C., Fundamentals of Digital Signal Processing, Harper & Row Publishers
4. Van Valkenburg M.E., Analog Filter Design, Holt Saunders
5. Terrel T.J. & Shark L.K., Digital Signal Processing, Macmillan
6. Sanjit K. Mitra, Digital Signal Processing- A Computer- Based Approach, Tata McGraw-Hill.

### IT 4255: E-commerce & E-governance

E-commerce: What is e-Commerce? Defining B2B, B2C and C2C Commerce. Advantages & Disadvantages of e-commerce, Tools for enabling e-commerce. Internet, Extranet, Intranet, WWW, Web Pages & their Design, HTML, XML, WML, WAP. B2B Commerce: Electronic Data Interchange Standards EDIFACT, ANSI X12, Value Added Network Services, Security Issues in e-Commerce, Symmetric Key Encryption, Digital Encryption Standards (DES), Public Key Encryption, RSA System

Digital Signature, Digital Signature Certification Authority, MIME and MIME Standards, PGP for e-mail. B2C Commerce: Varieties of Business, New Business Models, Electronic Payment Systems, Credit Cards, Electronic Funds Transfer, Electronic Cheque Payments, Electronic Cash, Issues in Cash Payment, Micro Payments over the Internet, Digital Watermark, C2C Commerce.
E-Governance: Introduction to e-Governance, Understanding the Relationship - governance and e-governance; e-Governance: analysing the concept; e-Government at work: e-administration and e-services; e-Democracy; Local e-government. Joined-up Government,National Land & Property Gazetteer (NLPG) - meta-frameworks and interoperability in action - GIS systems, Pathfinder-Beacon councils, Consortia approach - East Lancs Portal, Greater Manchester Fire Service – eFire, Salford City Council - One Stop Shop, eEnvoy, International Perspectives on eGovernment - Focus on Malaysia, US Perspectives on eGovernment, Mayor-led Cities - Evaluation of City in Philippines. e-Governance and democratic governance via the Internet; e-Governance and information systems in public administration and services; Information security and privacy protection; Future directions of e-governance.

*Suggested Books***:**
1. *E-Commerce Services and Application: A Practical Guide by Lee Sai Peck, Mohammad Zahidur Rahman.*
2. *E-Commerce by Smith R, Speaker M, & Thompson M (Prentice Hall, India)*
3. *Designing Systems for Internet Commerce by Trease GW & Stewart LC*
4. *E-Governance: A Global Perspective on a New Paradigm by Toshio Obi (Editor), IOS Press.*
5. *eCommerce: Formulation of Strategy by Robert T. Plant, Prentice Hall*
6. *E-Governance: Styles of Political Judgement in the Informaton Age Polity by Perri 6, Palgrave Macmillan*

### IT 4257: Cryptography

Classical Cryptography: Introduction to simple cryptosystems, Cryptanalysis; Shannon's Theory: Perfect secrecy, Entropy, Product cryptosystems; Data Encryption Standard: Description of DES, Differential cryptanalysis; RSA System and Factoring: Public-key cryptography, RSA cryptosystem, Attacks on RSA, Factroing algorithms; Other Public-key cryptosystems: ElGamal cryptosystem and discrete logs, Merkle-Hellman Knapsack System; Signature Schemes: ElGamal signature schemes, Digital signature standard, Fail-stop signatures; Hash Functions: Signatures and Hash functions, Collision-free Hash functions, Birthday attack; Key Distribution and Key Agreement: Key predistribution, Kerboros, Diffie-Hellman key exchange; Identification Schemes: Schnorr identification scheme, Okamoto identification schemes; Authentication Codes: Computing deception probabilities, Combinatorial bounds, Entropy bounds; Secret Sharing Schemes: Shamir threshold scheme, Access structure and general secret sharing; Pseudo-random Number Generation: Indistinguishable probability distribution, probabilistic encryption; Zero-knowledge proofs: Interactive proof systems, computational Zero-knowledge proofs.

*Suggested Books***:**
1. Dominic Welsh – Codes and Cryptography, Oxford University Press
2. Patterson, Wayne (1987). Mathematical Cryptology for Computer Scientists and Mathematicians, Rowman & Littlefield, ISBN 0-8476-7438-X
3. Konheim, Alan G. (1981). Cryptography: A Primer, John Wiley & Sons

### IT 4259: Computer Network Security

Introduction to Information Security Basic: Definition of Computer Security, Secrecy and Confidentiality, Accuracy, Integrity and Authenticity, People, Process and Technology, Security Threats, Vulnerabilities, Threats and Countermeasures, IDS, IPS and Firewall, Information and It's Control, Access Control and Separation of Duties Control, Planning and Administration, Security Policy, Security Model, Security Kernel, Security Perimeter, Audit Trail Analysis, Log analysis basic, Logging states, When to look at the logs, Log overflow and aggregation, Introduction of Encryption, Security information Management, Communications and Network Security, Physical Security and Biometrics, Introduction to Information, Network Security: Introduction: Security attacks, Security services, A model for network security, Conventional Cryptography: A General Model, The Shift Cipher, The Substitution, Cipher The Permutation Cipher, The Vigen´ere Cipher, The Hill Cipher, Stream Cipher, Product Cryptosystems, Modular Arithmetic

Modern Block Ciphers: The Data Encryption Standard, Attacks on DES, DES Modes and Triple-DES, the Advanced Encryption Standard, Some Other Block Ciphers, Finite Fields,

Public Key Encryption: Some Math Facts in Number Theory, RSA Public-key System, ElGamal Cryptosystem, Other Public-key Cryptosystems, Public-key Systems and Secret-key Systems, Attacks for Public Key Systems

Information Authentication: Signature Schemes, Message Authentication and Hash Functions, Key Distribution, Public Key Infrastructure.

Remote Access Control: UNIX Password Systems, One Time Password, Secure Shell. E-Mail Security: Pretty Good Privacy, S/MIME.

Web Security: SSL, Secure Electronic Transaction (SET).

IP Secure: TCP/IP Protocol, IPSec documents, Authentication Header, Encapsulating Security Payload (ESP), Key Management.

Firewall: Some Characteristics of firewall, Common Types of Firewall, Implementation of Firewall.

***Suggested Books:***
1.  William Stallings, "Cryptography and network security - Principles and practice", Pearson education Asia, Prentice Hall.
2.  Charles P. Pfleeger. "Security in Computing", Prentice Hall.
3.  Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc.
4.  D.R. Stinson, Cryptography: theory and practice, CRC Press.
5.  Web Security, Privacy & Commerce, Grarfinkel and Spafford, O'Reilly.


**IT 4261:** Optical Fiber Communication

Introduction. Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and co-channel interference.

***Suggested Books:***
1.  *J. Senior, "Optical Communication, Principles and Practice", Prentice Hall.*
2.  *J. Gower, "Optical Communication System", Prentice Hall.*
3.  *G. Keiser, "Optical Fiber Communication", 3rd ed., McGraw-Hill International.*