SYLLABUS FOR B.Sc. (Hons.) 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; in first year, the semesters will be semester 1 and semester 2; in second year, the semesters will be semester 1 and semester 2; and so on. Each semester will have the duration of six months. Students shall be evaluated in each semester.

Duration of Semesters:

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:

<table>
<thead>
<tr>
<th>Sl.</th>
<th>Segment</th>
<th>Period</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Classes</td>
<td>1st Week to 15th Week</td>
<td>15 Weeks</td>
</tr>
<tr>
<td>II</td>
<td>Preparatory leave before semester-end examination</td>
<td>16th Week to 17th Week</td>
<td>2 Weeks</td>
</tr>
<tr>
<td>III</td>
<td>Semester-end examination</td>
<td>18th Week to 19th Week</td>
<td>2 Weeks</td>
</tr>
<tr>
<td>IV</td>
<td>Result Publishing &amp; Semester Break</td>
<td>20th Week to 22nd Week</td>
<td>3 Weeks</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>22 Weeks</td>
</tr>
</tbody>
</table>

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 deemed 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. (Hons.) 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. 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 newspapers and also available on the website 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.
The following example illustrates a course representation system:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credit hours</th>
<th>Contact hour per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT 1203</td>
<td>Object Oriented Programming</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
</tbody>
</table>

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 149160 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 sixth 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.

Project Works:
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 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 (from the faculty of the Institute) and external members who will be an expert on the related fields. There will be a minimum of two internal members in the Board of Examiners.

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:

a) Theoretical Courses
   - Class/Continuous Assessment: 40%
   - Final examination: 60%

b) Practical Courses
   - Class/Continuous Assessment: 60%
   - Final examination: 40%

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:
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:

<table>
<thead>
<tr>
<th>Class participation / Attendance</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class test / Tutorial</td>
<td>20%</td>
</tr>
<tr>
<td>Experimental Evaluation</td>
<td>10%</td>
</tr>
<tr>
<td>Report</td>
<td>10%</td>
</tr>
<tr>
<td>Quiz / viva</td>
<td>10%</td>
</tr>
<tr>
<td>Semester-end Examination</td>
<td>40%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

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:

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

Earned Credits:
i) 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.
ii) 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.
iii) 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:
i) 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.

ii) 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

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/ Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 1101</td>
<td>Information Technology Fundamentals</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 1103</td>
<td>Introduction to Programming Environment</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 1105</td>
<td>Electrical Circuits</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 1107</td>
<td>Differential and Integral Calculus</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 1109</td>
<td>Communicative English</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 1104</td>
<td>Structured Programming Language Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 1106</td>
<td>Electrical Circuits Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 1100</td>
<td>Viva</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit 18.5

First Year Second Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/ Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 1201</td>
<td>Data Structures</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 1203</td>
<td>Object Oriented Programming</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 1205</td>
<td>Complex Variable and Vector Algebra</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 1207</td>
<td>Economics</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 1209</td>
<td>Accounting</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 1202</td>
<td>Data Structures Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 1204</td>
<td>Object Oriented Programming Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 1200</td>
<td>Viva</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit 18.5
### Second Year First Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 2101</td>
<td>Algorithm Analysis</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 2103</td>
<td>Computer Architecture</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 2105</td>
<td>Electronic Devices and Circuits</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 2107</td>
<td>Ordinary and Partial Differential Equation</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 2109</td>
<td>Statistical and Probability Theory</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 2102</td>
<td>Algorithm Analysis Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 2104</td>
<td>Computer Architecture Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 2106</td>
<td>Electronic Devices and Circuits Lab</td>
<td>1.5</td>
<td>6 hrs.</td>
</tr>
<tr>
<td>9</td>
<td>IT 2100</td>
<td>Viva</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Credit</strong></td>
<td><strong>20.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Second Year Second Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 2201</td>
<td>Information System Analysis</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 2203</td>
<td>Digital Logic Design</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 2205</td>
<td>Data Communication</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 2207</td>
<td>Discrete Math</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 2209</td>
<td>Computational Mathematics</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 2202</td>
<td>Information System Analysis Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 2204</td>
<td>DLD Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 2210</td>
<td>Computational Mathematics Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>9</td>
<td>IT 2200</td>
<td>Special Study (Industrial Tour) and Viva</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Credit</strong></td>
<td><strong>20.5</strong></td>
<td></td>
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</table>

### Third Year First Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 3101</td>
<td>Database Management System</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 3103</td>
<td>Computer Network and Internet Technology</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 3105</td>
<td>Signal and System</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 3107</td>
<td>Operating System</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 3109</td>
<td>Telecommunication Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IT 3102</td>
<td>Database Management System Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 3104</td>
<td>Computer Network and Internet Technology Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 3106</td>
<td>Signal and System Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>9</td>
<td>IT 3100</td>
<td>Viva</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Credit</strong></td>
<td><strong>21.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Third Year Second Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hr/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 3201</td>
<td>Software Engineering</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 3203</td>
<td>Computer Graphics</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 3205</td>
<td>Web Technologies</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 3207</td>
<td>Microprocessor and Interfacing</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 3209</td>
<td>Introduction to Bio-informatics</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 3202</td>
<td>Software Engineering Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 3204</td>
<td>Computer Graphics Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 3206</td>
<td>Web Technologies &amp; Programming Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>9</td>
<td>IT 3208</td>
<td>Microprocessor and Interfacing Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>9</td>
<td>IT 3200</td>
<td>Viva</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Credit</strong></td>
<td><strong>21.5</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Fourth Year First Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hrs/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 4101</td>
<td>Artificial Intelligences &amp; Neural Networks</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 4103</td>
<td>Management Information System</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 4105</td>
<td>Human Computer Interfacing</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 4107</td>
<td>Parallel and Distributed System</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 4109</td>
<td>Multimedia Systems &amp; Application</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 4102</td>
<td>Artificial Intelligences &amp; Neural Networks Lab</td>
<td>1.5</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>IT 4100</td>
<td>Viva +Thesis/Project Proposal</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Credit</td>
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</table>

### Fourth Year Second Semester

<table>
<thead>
<tr>
<th>SL</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hrs</th>
<th>Class Hrs/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 4201</td>
<td>Computer Network Security</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 4203</td>
<td>Wireless &amp; Mobile Communication</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 42XX</td>
<td>From Option-I</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 42XX</td>
<td>From Option-II</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 42XX</td>
<td>Option-I/Option II</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 4299</td>
<td>Thesis/Project</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>7</td>
<td>IT 4200</td>
<td>Viva</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Total Credit</td>
<td></td>
<td>21.0</td>
<td></td>
</tr>
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</table>

#### Option- I

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Class Hrs/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 4204</td>
<td>Embedded System Design</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 4206</td>
<td>Digital Signal Processing</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 4208</td>
<td>Digital Image Processing and Pattern Recognition</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 4210</td>
<td>Graph Theory and Applications</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 4212</td>
<td>Neuroinformatics</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 4214</td>
<td>Health Information Systems</td>
<td>3</td>
<td>3 hrs.</td>
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</table>

#### Option- II

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Class Hrs/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IT 4216</td>
<td>Digital Communication Systems</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>IT 4218</td>
<td>Speech Processing and Speech Recognition</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>IT 4220</td>
<td>E-commerce &amp; E-governance</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>IT 4222</td>
<td>Cryptography</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>5</td>
<td>IT 4224</td>
<td>Simulation and Modeling</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
<tr>
<td>6</td>
<td>IT 4226</td>
<td>Mobile application development</td>
<td>3</td>
<td>3 hrs.</td>
</tr>
</tbody>
</table>

Grand Total Credit Hour (for 4 years) = $(18.5+18.5+18.5+20.5+21.5+21.5+18.0+21.0) = 158$ credits
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.

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
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)
3. How to Program- Deitel / Deitel, C (Prentice Hall)
4. Problem solving and Progamming- Barclay, ANSI C (Prentice Hall)
5. Programming in ANSI C- E Balagurusamy

IT 1104: Structured Programming Lab
Syllabus based on IT 1103

IT 1105: Electronic Circuits

Suggested Texts:
2. Edminister J.A, Electric Circuits, Schaum's series, Mcgraw Hill
4. Introductory Circuit Analysis, Robert L. Boylestad.
5. Schaum's Outline of Electric Circuits, Mahmood Nahvi

IT 1106: Electronic 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 differentiability; Successive differentiation of various types of functions; 
Leibnitz’s Theorem; Rolle’s Theorem; Mean value Theorem in finite and infinite forms; Lagrange’s form of 
remainder; Cauchy’s form of remainder; Expansion of functions; Evaluation of indeterminate forms by L’Hospitals 
rule; Partial differentiation; Euler’s Theorem; Tangent and Normal, Subtangent and subnormal in Cartesian and 
polar co-ordinates; Maximum and minimum values of functions of single variable.
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:

IT 1109: Communicative English; 3 credits - 3 hours/week

English phonetics: the places and manners of articulation of the English sounds; Vocabulary; English 
grammar: construction of sentences, some grammatical problems; Comprehension; Paragraph 
writing; Prose writing; Amplification; Report writing; Business communication and tenders; Short 
stories written by some well-known classic writers.

REFERENCES:
1. T.M. Farhathullah, Communication Skills for Technical Students, Orient Longman 
Ltd., 2002.
2. Andrea J. Rutherford, Basic Communication Skills for Technology, 1st Edn., 

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 

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.

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

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:
2. Stewart and D. Tall, "Complex Analysis: (the hitchhiker's guide to the plane)", Cambridge University Press.

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:**
2. Wirth N, Algorithms + Data Structures= Programs, Prentice Hall

**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:**

**IT 2104: Computer Architecture Lab**
Syllabus based on IT 2103
**IT 2105: Electronic Devices and Circuits**


General frequency considerations for single stage or multi stage network: low and high frequency analysis and bode plot, multistage frequency effect and determining the cut-off frequencies. Operational Amplifiers (Op-Amp): Opamp characteristics, open loop voltage gain, differential input voltage, CMRR, zero crossing and voltage level detector and their applications; inverting amplifier, inverting adder, voltage follower, non-inverting amplifier, differentiator, integrator, and subtractor. DC performance: bias, offset and drift. AC performance: frequency parameter, unity-gain bandwidth, and slew rate. Various applications of opamps. Active filter: frequency response of four general classifications of filters for ideal and practical conditions; design and analysis of low pass filter that has -20dB/decade, -40dB/decade and -60dB/decade roll off; design and analysis of high pass filter that has 20dB/decade, 40dB/decade and 60dB/decade roll off; Band pass filter: narrow-band and wide-band filter. Feedback Amplifier: classification of amplifier as voltage, current, trans-resistance and trans-conductance amplifier, concept of feedback, advantage of negative feedback, general characteristics of negative feedback; input, output resistance and transfer gain of four basic amplifiers with and without feedback, effect of feedback on amplifier bandwidth, condition of stability and the Nyquest criterion. Sinusoidal oscillator: the Barkhausen criterion, phase shift oscillator, general form of oscillator circuits; Colpitts oscillator, Hartley Oscillator, Crystal oscillator. Power amplifiers: Class A, Class b and Class AB amplifiers; analysis of AC and DC load lines. Multivibrator circuits

**Suggested Texts:**


**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
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

**YEAR II: SEMESTER 2**

**TOTAL CREDIT: 20.5**

**IT 2201: Information System Analysis**


**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

**IT 2201: Information System Analysis**  
Syllabus based on IT 2202

**IT 2203: Digital Logic Design**  

*Suggested Texts:*
   Suggested  

**IT 2203: Digital Logic Design**  
Syllabus based on IT 2204

**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  
3. Halsall F., Data Communication, Computer Networks and Open Systems, Addison Wesley  
5. Bertsekas & Gallagar, Data Networks, PHI

**IT 2206: Digital Logic Design**  
Syllabus based on IT 2205
IT 2207 Discrete Mathematics
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:
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

Suggested Texts:
3. 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 3102

IT 3103: Computer Network & Internet Technologies
Protocol hierarchies; Data link control: HDLC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.2; 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
5. Keshav S., An Engineering Approach to Computer Networking, AWL
6. 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:
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.
Suggested Texts:
2. Silberschatz & Galvin, Operating System Concepts, Pearson Education Asia
4. Tanenbaum A.S., Modern Operating Systems, Prentice Hall of India / Pearson Education

IT 3108: Operating System Lab
Syllabus based on IT 3107

IT 3109: Telecommunication System Fundamentals
Introduction to Telecommunications: Beginning of Telecommunications, Evolution of Telecommunications, Telecommunications legislative history, Telecommunications PSTN Technology.
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.
Traffic Theory: The Erlang, Erlang’s lost call formula, Queuing systems.

Suggested Texts:
1. Fundamentals of Telecommunications-R. L. Freeman,
3. W. Fraser, “Telecommunications”
4. Sanjeeva Gupta, “Electronic Communications”.
6. Fundamentals Of Fibre Optics In Telecommunication And Sensor Systems- Bishnu P. Pal

YEAR III: SEMESTER 2
(TOTAL CREDIT: 21.5)

IT 3201: Software Engineering; 3 credits - 3 hours/week
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 software 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; 2nd edition; Pearson Education Asia
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**  

*Suggested Books*

**IT 3204: Computer Graphics Lab**  
Syllabus based on IT 3203

**IT 3205: Web Technologies**


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


*Suggested Books:*

**IT 3206: Web Technologies 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
Suggested Books:

IT 3208: Microprocessor and Interfacing Lab
Laboratory Works based on IT 3207

IT 3209: Introduction to Bio-informatics
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.

Suggested Books:

YEAR IV: SEMESTER 1
(TOTAL CREDIT: 18.0)

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.
Knowledge Representation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propositional 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
Characteristics of Neural Networks: Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units.
Feedback Neural Networks: Introduction, Analysis of Linear Autoassociative FF Networks, Analysis of Pattern Storage Networks.
Competitive Learning Neural Networks & Complex pattern Recognition: Introduction, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Networks, Associative Memory.

Suggested Books:
2. Artificial Neural Networks B. YagnaNarayana, PHI
4. Artificial Intelligence and Expert Systems – Patterson PHI,
6. Neural Networks Simon Haykin PHI

IT 4102: Artificial Intelligences & Neural Networks Lab
Laboratory Works based on IT 4101

IT 4103: 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:

IT 4105: Human Computer Interfacing
Introduction: Goals of human-computer interaction and its relevance to the applications of interactive computer systems.


Help: Assisting the user. Requirements for help systems. Main approaches. Adaptive and adaptable interfaces.


Suggested Books:

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.

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:

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:

YEAR IV: SEMESTER 8
TOTAL CREDIT: 21.0

IT 4201: Computer Network Security
Information Authentication: Signature Schemes, Message Authentication and Hash Functions, Key Distribution, Public Key Infrastructure.
Firewall: Some Characteristics of firewall, Common Types of Firewall, Implementation of Firewall.

Suggested Books:

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:
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:
IT 4223: 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:

5. Terrel T.J. & Shark L.K., Digital Signal Processing, Macmillan

IT 4225: Digital Image Processing and Pattern Recognition


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

Pattern Recondition: Introduction to Formal Languages, String Languages for Pattern Description. Higher Dimensional Pattern Grammars, Syntax Analysis as a Recognition Procedure, Stochastic Languages, Error-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:**

**IT 4227: Graph Theory and Applications**
Introduction, Fundamental concepts, Trees, Spanning trees in graphs, Distance in graphs, Eulerian graphs, Digraphs, Matching and factors, Cuts and connectivity, k-connected graphs, Network flow problems, Graph coloring: vertex coloring and edge coloring, Line graphs, Hamiltonian cycles, Planar graphs, Perfect graphs.

**Suggested Books:**
1. *Handbook of Graph Theory*: Jonathan L. Gross and Jay Yellen
2. *Graph Theory and Its Applications* Jonathan L Gross and Jay Yellen
3. *Graph Theory with Applications*: John Adrian Bondy

**IT 4229: Neuroinformatics**

**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: Health Information Systems**
Background Readings; Professional Organizations to Join; Case Study in Breast Cancer, National Perspectives; Electronic Health Records; E-Prescribing, Case Studies in Patient-Care/Clinical Decision-Support Systems and Genomics; Landing a Job in Informatics, Introduction to Organizing Data with Excel; Basics of Excel, Excel Functions, Excel Charting, Occupational Safety and Health / Environmental Assessment; Professional Writing, Introduction to Organizing Data with Access; Building Tables in Access, Queries in Access, Reports in Access, Ethical Protocols for Data, Collection; Protecting Human Research Participants, Health Information Systems and National Crises

**Suggested Books:**
2. *E-health Care Information Systems*: An Introduction For Students And Professionals, Joseph K. H. Tan
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 coding; 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: 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 4255: E-commerce & E-governance

Suggested Books:
3. “Designing Systems for Internet Commerce” by Tresa GW & Stewart LC

IT 4257: Cryptography

Suggested Books:
1. Dominic Welsh – Codes and Cryptography, Oxford University Press

IT 4259: 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

IT 4261: 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.