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; 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:

Sl.	Segment	Period	Length
I.	Classes	1st Week to 15th Week	15 Weeks
II.	Preparatory leave before semester-end examination	16th Week to 17th Week	2 Weeks
III.	Semester-end examination	18th Week to 19th Week	2 Weeks
IV.	Result Publishing & Semester Break	20th Week to 22nd Week	3 Weeks
		Total	22 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. (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 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.

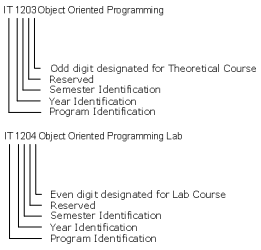
Rules for Admission:
Procedures for admission shall be guided as per rules of the University.

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.



The following example illustrates a course representation system:

Course Number	Course Title	Credit hours	Contact hour per week Theory-Lab
IT 1203	Object Oriented Programming	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 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:

	Class participation / Attendance	*10%*
	Class test/Tutorial	*20%*
	Experimental 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+	(A Plus)	4.00
75% to less than 80%	A	(A Regular)	3.75
70% to less than 75%	A-	(A Minus)	3.50
65% to less than 70%	B+	(B Plus)	3.25
60% to less than 65%	B	(B Regular)	3.00
55% to less than 60%	B-	(B Minus)	2.75
50% to less than 55%	C+	(C Plus)	2.50
45% to less than 50%	C	(C Regular)	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:

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

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	1.0	
		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	Telecommunication Systems	3	
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	21.5	

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.
	IT 3209	Introduction to Bio-informatics	3	3 hrs.
5	IT 3202	Software Engineering Lab	1.5	3 hrs.
6	IT 3204	Computer Graphics Lab	1.5	3 hrs.
7	IT 3206	Web Technologies & Programming Lab	1.5	3 hrs.
8	IT 3208	Microprocessor and Interfacing Lab	1.5	3 hrs.
9	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	Management Information System	3	3 hrs.
3	IT 4105	Human Computer Interfacing	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.
8	IT 4100	Viva +Thesis/Project Proposal	1.5	
		Total Credit	18.0	

Fourth Year Second Semester

SL	Course Code	Course Title	Credit Hrs	Class Hr/ Week
1	IT 4201	Computer Network Security	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	3 hrs.
7	IT 4200	Viva	1	
		Total Credit	21.0	

Option- I				
Sl. No	Course Code	Course Title	Credit Hours	Class Hrs./ week
1	IT 4204	Embedded System Design	3	3 hrs.
2	IT 4206	Digital Signal Processing	3	3 hrs.
3	IT 4208	Digital Image Processing and Pattern Recognition	3	3 hrs.
4	IT 4210	Graph Theory and Applications	3	3 hrs.
5	IT 4212	Neuroinformatics	3	3 hrs.
6	IT 4214	Health Information Systems	3	3 hrs.
Option- II				
1	IT 4216	Digital Communication Systems	3	3 hrs.
2	IT 4218	Speech Processing and Speech Recognition	3	3 hrs.
3	IT 4220	E-commerce & E-governance	3	3 hrs.
4	IT 4222	Cryptography	3	3 hrs.
5	IT 4224	Simulation and Modeling	3	3 hrs.
6	IT 4226	Mobile application development	3	3 hrs.

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.
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: Electronic 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: 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 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:

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; Pr鈍s 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., Pearson Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.

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 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:

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

Basic Semiconductor and pn-junction theory: Energy Bands, Conductors, Insulators and semiconductors, p-type and n-type semiconductors, Drift and Diffusion Current. P-N junction as a circuit element: operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified dc and ac diode models, dynamic resistance and capacitance. Diode applications: Half wave and full wave rectifiers, rectifiers with filter capacitor, clamping and clipping circuits. Zener diode: characteristics of a zener diode, zener shunt regulator. Bipolar junction Transistors (BJT): Basic structure, BJT characteristics and regions of operation, BJT Currents, BJT Terminal Voltages, BJT voltage amplification. Bipolar Junction Transistor Biasing: The dc load line and bias point, biasing the BJT for discrete circuits, small signal equivalent circuit models, h parameters. Single-stage BJT amplifier circuits and their configurations: Voltage and current gain, input and output impedances. Field-Effect Transistors (FET): Construction and Characteristics of JFET, transfer characteristics, FET voltage amplification, FET bias circuits. Metal-Oxide-Semiconductor Field-Effect-Transistor (MOSFET) as circuit element: structure and physical operation of MOSFETs, body effect, current-voltage characteristics of MOSFETs, biasing discrete and integrated MOS amplifier.

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:

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 2201: Information System Analysis
Syllabus based on IT 2202

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 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
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: Digital Logic Design
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. Elmasri & Navathe, "Fundamentals of Database Systems", Addison Wesley
2. Ramakrishnan R. & Gehrke J., "Database Management Systems", McGraw Hill
3. O'neil P. & O'neil E., "Database Principles, Programming, And Performance", Harcourt Asia, Morgan Kaufman

4. Silberschatz A., Korth H.F. & Sudarshan S., "Database System Concepts", Tata McGraw Hill

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

IT 3103: Computer Network & Internet Technologies
Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.*; 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. 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:

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.

Suggested Texts:

1. Nutt G.J., Operating Systems - A Modern Perspective, Pearson Education Asia
2. Silberschatz & Galvin, Operating System Concepts, Pearson Education Asia
3. Crowley C., Operating Systems-A Design Oriented Approach, Tata McGraw Hill
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.

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

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 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; 2nd edition; Pearson Education Asia
2. Pressman R.S.; Software engineering - A practitioner's approach; 5th 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, 2nd ed., McGraw-Hill Series on Computer Communication.
2. Chris Bates: Web Programming. Building Internet Applications, 2nd ed., John Wiley & Sons, Ltd., 2002.
3. Douglas E. Comer: Computer Networks and Internets with Internet Applications, 3rd ed., Prentice Hall International, Inc., 2001.

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

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, 3rd edition.

IT 3208: Microprocessor and Interfacing Lab

Laboratory Works based on IT 3207

IT 3209: Introduction to Bio-informatics

Coding: Common health care language - coding techniques – coded and quasi coded data – Medical vocabulary – industry wide communication standards HL7 – unified medical language system – quality of care paradigms, risk management bioethics.
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.
Patient record maintenance: Electronic patient record – models or ERP – environmental services – metrics – telemedicine – community networks – telemedicine peripherals and equipment selection – anatomy of video conferencing technology.
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: Data base searching - comparison of two sequences – identity and similarity – global and global similarity – global and local alignment - multiple sequence alignment – data basis of multiple alignment – secondary data base.
Expert system: Principles of expert system – statistical decision trees – integration of decision support in clinical processors.

***Suggested Books*:**

1. T.K. Attwood and D.J Perry – Smith, Introduction to Bio-Informatics, Long man.
2. Coiera E, Guide to medical informatics, The internet and telemedicine, Chajsman & Hall medical, London.
3. Bernser, E.S. Clinical decision support systems, Theory and practice, Springer- Verlag, New York.

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.

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

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.
Feedforward Neural Networks: Introduction, Analysis of pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of pattern storage Networks.Analysis of Pattern Mapping Networks.
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*:**

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: 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 4105: Human Computer Interfacing

Introduction: Goals of human-computer interaction and its relevance to the applications of interactive computer systems.

Psychological Aspects: Cognitive psychology. Sensory channels. Human limitations and expectations in perceptual processes. Visual perception. Auditory perception. Haptic perception. Human memory: sensory, short-term, long-term. Individual differences. Mental models. Metaphors. Human error: slip and mistake.

Devices for Human-Computer Interaction: Text input devices. Positioning and pointing devices. 3D devices. Devices for visual, auditory, and haptic output. Interfaces and devices for disabled users.
Models and Paradigms of Human-Computer Interaction: Characterizing different phases of interaction. Ergonomic aspects of interaction. Interaction styles: from command language to 3D interfaces. Window interfaces (WIMP). Menu and icon design. Interaction paradigms.
Human-Computer Interaction and the Software Life-Cycle: Analysis of usability requirements. Usability principles. User-centred design. Usability engineering. Prototyping techniques. Envisioning design techniques. Design rationale.
Environment. User, Task Analysis: Characterizing the context of interaction with socio-technical models.The USTM/CUSTOM technique. Task analysis. The HTA technique. Predictive models: GOMS, KLM.
Formal Methods in Human-Computer Interaction: State transition network ed altre notazioni diagrammatiche. Notazioni testuali. Progetto ed analisi di dialogo mediante state transition network.
Guidelines and Standard for User Interfaces: Definition. Choosing and using guidelines. Examples of guidelines: MITRE, Apple, Microsoft. IBM guidelines for 3D interfaces. The ISO 9241 standard.
Tools for User Interface Implementation: Windowing System. Programming techniques. Toolkit. Case study: the Java toolkit. User Interface Management Systems.
Usability Evaluation: Goals of evaluation. Recording tools. Observing the user. Collecting opinions. Interviews. Questionnaires. Experiments. Predictive evaluation. Cognitive walkthrough. Interpretive evaluation.
Help: Assisting the user. Requirements for help systems. Main approaches. Adaptive and adaptable interfaces.
Computer-Supported Cooperative Work: Groupware. Computer-mediated communication. E-mail and textual communication systems. Videoconference. Virtual collaborative environments. Workflow systems. Experimental and organizational aspects.
Recent Paradigms of Human-Computer Interaction: Ubiquitous computing. Virtual reality. Types of virtual reality. Multi-sensory (or multi-modal) interfaces. Information visualization. Hypertext. Multimedia and Hypermedia interfaces. WWW interfaces. Design of usable Web pages.

***Suggested Books*:**

1. Picard, R. (2000) Towards computers that recognize and respond to emotion, IBM System Journal, Vol. 39, 705-719
2. Shneiderman, B. (1998) Designing the user Interface, third edition, Adison-Wesley Publishing Company, New York
3. Preece, J. (1998) Emphatic Communities: Reaching Out Across the Web, Interactions, Vol 2, 32-43
4. Gibson, J.J. (1979) The Ecological Approach to Visual Perception, Houghton-Mifflin,
5. Laurel, B. (1991) The Art of Human-Computer Interface Design, (edited volume) Adison-Wesley Publishing Company, New York
6. Norman, D.) Psychology of Everyday Things, Basic Books
7. Norman, D. The Invisible Computer, MIT Press, Cambridge, Massachusetts
8. A. Dix, J. Finlay, G. Abowd and R. Beale. Human Computer Interaction, Third Edition, Prentice Hall.

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: 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 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: 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 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: 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*
4. *Theory of Graphs and its Applications- Claude Berse*

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: 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*:**

1. Health Information Systems, **Winter**, A., **Haux**, R., **Ammenwerth**, E., **Brigl**, B., **Hellrung**, N., **Jahn**, F.
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 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: 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

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, 2000)*
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 (September 15, 2007).*
5. *"eCommerce: Formulation of Strategy" by Robert T. Plant, Prentice Hall|(June 28, 2000)*
6. *"E-Governance: Styles of Political Judgement in the Informaton Age Polity", by Perri 6, Palgrave Macmillan (June 12, 2004)*

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: 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

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.