ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Gazipur, Bangladesh

COURSE STRUCTURE AND COURSE CONTENTS
FOR
BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND ENGINEERING

Effective from Academic Year 2015-16

Department of

COMPUTER SCIENCE AND ENGINEERING (CSE)

January 2018

Course Requirement for Undergraduate Computer Science and Engineering Students

L=Lecture, P= Practical

FIRST SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Hum 4145	Islamiat	2-0	2.0
Hum 4147	Technology, Environment and Society	3-0	3.0
Math 4141	Geometry and Differential Calculus	4-0	4.0
Phy 4141	Physics I	3-0	3.0
CSE 4105	Computing for Engineers	3-0	3.0
CSE 4107	Structured Programming I	3-0	3.0
		18.0	**18.0**
Hum 4142 OR Hum 4144	Arabic I English I	0-2 0-2	1.0 1.0
Phy 4142	Physics I Lab	0-3/2	0.75
CSE 4108	Structured Programming I Lab	0-3	1.5
CSE 4104	Engineering Drawing Lab	0-3/2	0.75
		8.0	**4.0**
	Contact Hours: 26.00 Credit Hours: 22.00		

SECOND SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Hum 4241	Islamic History Science and Culture	2-0	2.0
Math 4241	Integral Calculus and Differential Equations	4-0	4.0
Phy 4241	Physics II	3-0	3.0
Chem 4241	Chemistry	3-0	3.0
CSE 4203	Discrete Mathematics	3-0	3.0
CSE 4205	Digital Logic Design	3-0	3.0
		18.0	**18.0**
Hum 4242 OR Hum 4244	Arabic II English II	0-2 0-2	1.0 1.0
Phy 4242	Physics II Lab	0-3/2	0.75
Chem 4242	Chemistry Lab	0-3/2	0.75
CSE 4202	Structured Programming II Lab	0-3	1.5
CSE 4206	Digital Logic Design Lab	0-3/2	0.75
		9.5	**4.75**
	Contact Hours: 27.50 Credit Hours: 22.75		

THIRD SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Math 4341	Linear Algebra	3-0	3.0
EEE 4383	Electronic Devices and Circuits	3-0	3.0
CSE 4301	Object Oriented Programming	3-0	3.0
CSE 4303	Data Structures	3-0	3.0
CSE 4305	Computer Organization and Architecture	3-0	3.0
CSE 4307	Database Management Systems	3-0	3.0
		18	**18**
EEE 4384	Electronic Devices and Circuits Lab	0-3/2	0.75
CSE 4302	Object Oriented Programming Lab	0-3	1.5
CSE 4304	Data Structures Lab	0-3	1.5
CSE 4308	Database Management Systems Lab	0-2	1.0
		9.5	**4.75**
	Contact Hours: 27.50 Credit Hours: 22.75		

FOURTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Hum 4441	Engineering Ethics	3-0	3.0
Math 4441	Probability and Statistics	3-0	3.0
EEE 4483	Digital Electronics and Pulse Techniques	3-0	3.0
CSE 4403	Algorithms	3-0	3.0
CSE 4405	Data and Telecommunications	4-0	4.0
CSE 4407	System Analysis and Design	2-0	2.0
		18.0	**18.0**
EEE 4484	Digital Electronics and Pulse Techniques Lab	0-3/2	0.75
CSE 4402	Visual Programming Lab	0-3	1.5
CSE 4404	Algorithms Lab	0-2	1.0
CSE 4408	System Analysis and Design Lab	0-2	1.0
		8.5	**4.25**
	Contact Hours: 26.50 Credit Hours: 22.25		

FIFTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
CSE 4501	Operating Systems	3-0	3.0
CSE 4503	Microprocessor and Assembly Language	3-0	3.0
CSE 4511	Computer Networks	3-0	3.0
CSE 4513	Software Engineering and Object Oriented Design	3-0	3.0
	Elective 5-I	3-0	3.0
	Elective 5-II	3-0	3.0
		18.0	**18.0**
CSE 4502	Operating Systems Lab	0-2	1.0
CSE 4504	Microprocessor and Assembly Language Lab	0-3/2	0.75
CSE 4508	RDBMS Programming Lab	0-3	1.5
CSE 4510	Software Development	0-3/2	0.75
CSE 4512	Computer Networks Lab	0-3	1.5
	Elective 5-II Lab	0-3/2	0.75
		12.5	**6.25**
CSE 4590	Industrial Training*	0-2	1.0
	Contact Hours: 30.50 Credit Hours: 24.25		
	Contact Hours: 32.50 Credit Hours: 25.25*		
ELECTIVE 5-I			
Math 4541	Multivariable Calculus and Complex Variables	3-0	3.0
CSE 4531	E-Commerce and Web Security	3-0	3.0
CSE 4537	Decision Support Systems	3-0	3.0
CSE 4547	Parallel and Distributed Systems	3-0	3.0
ELECTIVE 5-II			
CSE 4539	Web Programming	3-0	3.0
CSE 4543	Geographical Information Systems	3-0	3.0
CSE 4549	Simulation and Modeling	3-0	3.0
CSE 4551	Computer Graphics and Multimedia Systems	3-0	3.0
CSE 4540	Web Programming Lab	0-3/2	0.75
CSE 4544	Geographical Information Systems Lab	0-3/2	0.75
CSE 4550	Simulation and Modeling Lab	0-3/2	0.75
CSE 4552	Computer Graphics and Multimedia Systems Lab	0-3/2	0.75

*Only for HD

SIXTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Hum 4641	Accounting	3-0	3.0
CSE 4615	Wireless Networks	2-0	2.0
CSE 4617	Artificial Intelligence	3-0	3.0
CSE 4619	Peripherals and Interfacing	3-0	3.0
	Elective 6-I	3-0	3.0
	Elective 6-II	3-0	3.0
		17.0	**17.0**
CSE 4610	Design Project**	0-3	1.5
CSE 4614	Technical Report Writing	0-3/2	0.75
CSE 4616	Wireless Networks Lab	0-3/2	0.75
CSE 4618	Artificial Intelligence Lab	0-3/2	0.75
CSE 4620	Peripherals and Interfacing Lab	0-3/2	0.75
	Elective 6-I Lab	0-3/2	0.75
	Elective 6-II Lab	0-3/2	0.75
		12.0	**6.0**
CSE 4600	Project/Thesis*	0-6	3.0
	Contact Hours: 29.0 Credit Hours: 23.0**		
	Contact Hours: 32.0 Credit Hours: 24.5*		
ELECTIVE 6-I			
Math 4641	Numerical Methods	3-0	3.0
CSE 4641	Distributed Operating Systems	3-0	3.0
CSE 4643	Mobile Application Development	3-0	3.0
CSE 4647	Distributed Database Systems	3-0	3.0
Math 4642	Numerical Methods Lab	0-3/2	0.75
CSE 4642	Distributed Operating Systems Lab	0-3/2	0.75
CSE 4644	Mobile Application Development Lab	0-3/2	0.75
CSE 4648	Distributed Database Systems Lab	0-3/2	0.75
ELECTIVE 6-II			
CSE 4631	Digital Signal Processing	3-0	3.0
CSE 4635	Web Architecture	3-0	3.0
CSE 4649	Systems Programming	3-0	3.0
CSE 4651	Unix Programming	3-0	3.0
CSE 4632	Digital Signal Processing Lab	0-3/2	0.75

SIXTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
CSE 4636	Web Architecture Lab	0-3/2	0.75
CSE 4650	Systems Programming Lab	0-3/2	0.75
CSE 4652	Unix Programming Lab	0-3/2	0.75

*Only for HD

**Only for B.Sc.

SEVENTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
Hum 4741 OR Hum 4743 OR Hum 4745	Business Communication and Law Engineering Economics International Relationship	2-0 2-0 2-0	2.0 2.0 2.0
Math 4741	Mathematical Analysis	3-0	3.0
CSE 4703	Theory of Computing	3-0	3.0
CSE 4709	Machine Learning	3-0	3.0
	Elective 7-I	3-0	3.0
	Elective 7-II	3-0	3.0
		17.0	**17.0**
CSE 4710	Machine Learning Lab	0-3/2	0.75
	Elective 7-II Lab	0-3/2	0.75
		3.0	**1.5**
CSE 4700	Project/Thesis	0-6	3.0
CSE 4790	Industrial Training	0-2	1.0
	Contact Hours: 28.0 Credit Hours: 22.50		
ELECTIVE 7-I			
CSE 4739	Data Mining	3-0	3.0
CSE 4743	Cryptography and Network Security	3-0	3.0
CSE 4745	Embedded Systems Design	3-0	3.0
CSE 4747	Computational Biology	3-0	3.0
ELECTIVE 7-II			
CSE 4733	Digital Image Processing	3-0	3.0
CSE 4735	Digital Systems Design	3-0	3.0
CSE 4749	Introduction to Cloud Computing	3-0	3.0
CSE 4751	Network Programming	3-0	3.0
CSE 4753	Bioinformatics	3-0	3.0
CSE 4734	Digital Image Processing Lab	0-3/2	0.75
CSE 4736	Digital Systems Design Lab	0-3/2	0.75
CSE 4750	Introduction to Cloud Computing Lab	0-3/2	0.75
CSE 4752	Network Programming Lab	0-3/2	0.75
CSE 4754	Bioinformatics Lab	0-3/2	0.75

EIGHTH SEMESTER			
Course Number	**Course Title**	**Contact Hours**	**Credit Hours**
		L-P	
CSE 4801	Compiler Design	3-0	3.0
CSE 4803	Graph Theory	3-0	3.0
CSE 4807	IT Organization and Management	3-0	3.0
CSE 4809	Algorithm Engineering	2-0	2.0
	Elective 8-I	3-0	3.0
	Elective 8-II	3-0	3.0
		17.0	**17.0**
CSE 4802	Compiler Design Lab	0-3/2	0.75
CSE 4810	Algorithm Engineering Lab	0-3/2	0.75
	Elective 8-II Lab	0-3/2	0.75
		4.5	**2.25**
CSE 4800	Project/ Thesis	0-6	3.0
	Contact Hours: 27.50 Credit Hours: 22.25		
ELECTIVE 8-I			
CSE 4841	Introduction to Optimization	3-0	3.0
CSE 4845	Introduction to Information Retrieval	3-0	3.0
CSE 4847	Information and OS Security	3-0	3.0
CSE 4849	Human Computer Interaction	3-0	3.0
CSE 4851	Design Pattern	3-0	3.0
ELECTIVE 8-II			
CSE 4833	VLSI Design and Testing	3-0	3.0
CSE 4835	Pattern Recognition	3-0	3.0
CSE 4839	Internetworking Protocols	3-0	3.0
CSE 4834	VLSI Design and Testing Lab	0-3/2	0.75
CSE 4836	Pattern Recognition Lab	0-3/2	0.75
CSE 4840	Internetworking Protocols Lab	0-3/2	0.75

Detailed outline of undergraduate courses offered by CSE department

Hum 4142 Arabic I 0-2 Credit 1.0

Contents:
Tajweed Rules of the Holy Quran; Letters and Pronunciation; Construction of words; Use of Numerical; Common Vocabularies; Name of Months, days and directions; Use of every day's conversation and dialogues and practice

Recommended Texts:
1. Learn How To Read Al-Qur'an: M. Rashed

Hum 4144 English I 0-2 Credit 1.0

Contents:
This course aims to give students of an international community accurate and meaningful communicating skills which will include expressions for personal identification (name, occupation, nationality etc.); body parts; time, day, week, months and years; daily programme; education and future career; entertainment; travel; postal, telephonic and telegraphic activities; health and welfare; food and drink; adjectives and comparatives and personal and formal written needs. Grammatical structures will emphasize the various tenses, and unit, articles, prepositions and adverbial particles; adverbs of manner, frequency, time and place; punctuation; model verbs; personal pronouns; affirmative; negative and question forms; and possessives and possessive adjectives.

This course deals with the practical and communicative aspects of the English Language by reinforcing and manipulating the sounds and grammatical patterns of the language needed in an international situation through dialogues with Audio – Language, Audio – Visual, silent way and total physical response, methods and techniques involving student participation in a language laboratory with the aids of audio and video cassettes, computer games and other communicative activities.

Hum 4145 Islamiat 2-0 Credit 2.0

Contents:
Tawheed: Taweedul Uluhia, Tawheedul Rububia and Tawheedul Asma-was-sifat, Aqeedah/creeds of Islam: Creeds of Ahlus-sunnah-wal-jamah; Sources of Islamic Code of Life; Social, Economic and Political system of Islam; Islamic ethics and Moral values: Human values in Islam, Dignity Family Ties; Role of Islam in eradicating social evils; Islam and the world peace

Recommended Texts:

1. Fundamentals Of Tawheed : Abu Ameenah Bilal Philips

Hum 4147	**Technology, Environment and Society**	**3-0**	**Credit 3.0**

Contents: Definition of terminology – technology, environment, society and development; Inter-dependence of technology, environment, society and development; Growth of technologies and its contribution to human development; Current state of technology and its future use as an instrument of change in twenty first century; Impact of technology upon the environment, impact of the environment upon human changes in the global climates; Environment friendly technology, Technology and development; Renewable energy and environments. Technology and environment hazards, its remedy. Major hazards of industry. The improvement of working conditions in the industry.

Math 4141	**Geometry and Differential Calculus**	**4-0**	**Credit 4.0**

Contents:

2D Co-ordinate Geometry: Change of axes: transformation of coordinates. Simplification of equations of the curves. Pair of straight lines: Homogeneous second degree equations. Conditions for general second degree equations to represent a pair of straight lines. Angle between the lines. Pair of straight lines joining the origin to the points of intersection of the curve and a line. Circles and system of circles: Tangents and normals. Pair of tangents. Chord of contact. Orthogonal circles. Radical axis and its properties. Parametric coordinates**.**

3D Co-ordinate Geometry: Rectangular coordinates. Direction cosines and angle between two lines. The plane and the straight lines. The equation of a sphere. The standard forms of equations of the central conicoids, cones and cylinders.

Differential Calculus: Limits, Continuity and Differentiability. Differentiation of explicit and implicit function and parametric equations. Significance of derivatives, Differentials, Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Mean value theorems. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Langrange's form of remainders. Cauehy's form of remainder. Expansion of functions by differentiation and integration. Partial differentiation. Euler's theorem. Tangent, maximum and minimum values of

functions and points of inflection. Applications of Differential Calculus. Evaluation of indeterminate forms by L'Hospitals rule, Curvature, center of curvature and chord of curvature. Evolutes and involutes. Asymptotes. Envelopes, Curve tracing.

Recommended Texts:

1. Calculus with Analytic Geometry, Author: H. Anton et. al.
2. The Elements of Coordinate Geometry, Author: S. L. Loney, M.A.
3. Calculus with Analytic Geometry, Author: E.W. Swokowski

Phy 4141 Physics I 3-0 Credit 3.0

Contents:

Modern Physics: Michelson Morley's experiment, Galilean transformation, special theory of relativity, Lorentz transformation, relative velocity, length contraction, time dilation, mass-energy relation, Photo-electric effect, Compton effect, de-Broglie wave, Bohr's atom model, radioactive decay, half-life, mean-life, isotopes, nuclear binding energy, alpha beta & gamma decay.

Electricity and Magnetism: Electric charge, Coulomb's law, electric field: calculation of the electric field strength, E, a dipole in an electric field, electric flux and Gauss's law, electric potential V, relation between E and V, electric potential energy; Capacitors: capacitance, dielectric-en atomic view, Ampere's law, Faraday's law, Lenz's law, self inductance and mutual inductance; Magnetic properties of matter: magnetomotive force, magnetic field intensity, permeability, susceptibility, classification of magnetic materials, magnetisation curve.

Physical Optics: Theories of light: Huygen's principle and construction; Interference of light: Young's double slit experiment, Fresnel bi-prism, Newton's rings, interferometers; Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings; Polarization: production and analysis of polarized light, optical activity.

Recommended Texts:

1. Physics II, Author: Halliday
2. Modern Physics, Author: Arther Baiser

Phy 4142 Physics I Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on Phy 4141

CSE 4104 Engineering Drawing Lab 0-3/2 Credit 0.75

Contents: Software will be used to practice the following:
Introduction of Engineering Drawings, Being familiar with the drawing instruments and their uses, drawing instruments including components and parts, drawing of geometrical figures.
Orthographic drawing, Isometric and oblique projections, First and Third angle projections, Drawing of block diagram and circuit diagram.

CSE 4107 Structured Programming I 3-0 Credit 3.0

Contents:
Introduction, Programming Concepts, Algorithm and Logic, Constants, Variables, Keywords and Data Types, Operators and expressions, Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping, Arrays, Multi-dimensional Arrays, Strings, User defined functions, Recursion, Structures and Unions, File Management in C, Pointers, Dynamic Memory Allocation and Linked List, The Preprocessor and some advanced topics, Advanced data types and operators.

Recommended Texts:
1. "Teach Yourself C" by Herbert Schildt, 4E
2. "Programming in ANSI C" by E Balagurusamy, 5E.

CSE 4108 Structured Programming I Lab 0-3 Credit 1.5

Contents: Sessional works based on CSE 4101.

Recommended Texts:
1. "Let Us C" by Yashavant P. Kanetkar, Fifth Edition.
2. Schaum's Outline of "Theory and Problems of Programming with C", second edition.

CSE 4105 Computing for Engineers 3-0 Credit 3.0

Contents:

How Computer Works
Internal Components of Computer
How Programs Work
Program Design
Pseudo Code, Flow Chart
Logic Design
Program Development
Operating System Basics
Introduction to Algorithm and Data Structure
Problem Solving and Understanding
Data Representation:
Number System, Conversion of Binary, Octal, Hexadecimal to Decimal, Conversion of Binary to Octal, Hexadecimal, Conversion of Octal, Hexadecimal to Binary, Binary Arithmetic, Signed and Unsigned Numbers, Binary Data Representation, Binary Coding Schemes, Logic Gates
Internet and the Web:
Internetworking Protocol, The Internet Architecture, Managing the Internet, Connecting to Internet, Internet Connections, Internet Address, Internet Services, Uses of Internet
Algorithms and programming:
Algorithms, Efficiency, High-level languages, Compilers & Interpreters
Role of Mathematics in Computer Science:
Applications and roles of Calculus, Linear Algebra, Statistics and Probability etc. in the field of computing
Computer Science as a Discipline:
CS as science, Central themes (software, hardware, theory), subfields of CS
Diversified applications of Computer Science and Engineering:
Biology/bioinformatics, Artificial intelligence, Cryptography

Recommended Texts:

1. Computer Fundamentals, Author: Anita Goel, Pearson Education, (Latest Edition)
2. Introduction to Computers, Author: Peter Norton, McGraw-Hill Publications Limited (Latest Edition)
3. A Balanced Introduction to Computer Science, David Reed, Prentice Hall, 2010

Hum 4241	**Islamic History, Science and Culture**	**2-0**	**Credit 2.0**

Contents:
Makki and madani lives of the Prophet Muhammad (PBUH). Caliphate of the rightly guided caliphs. Islamic Culture & Islamic festivals; Importance of acquiring knowledge of Science and Technology in the light of the Holy Quran and the Sunnah; Relation between Science & Technology and Islam; Scientific indications in the Holy Quran, Impact of Science, Technology and Religion on Society and Social Development. Contributions of Islamic Civilization and Scientific achievement on the development of modern Science and Technology.

Lang 4242	**Arabic II**	**0-2**	**Credit 1.0**

Contents:
Reading Comprehension: Use of determiners and pronouns; Use of interrogatives; Use of nominal and verbal sentences Use of adverbs; Use of tenses; Use of Feminine & Masculine Genders; Conjunctive Adverbs; Nouns; Singular; Plural and various modifications caused by them; Use of verbs with different persons and all pronouns; Use of new words (nouns & verbs) by changing different parts of speech

Lang 4244	**English II**	**0-2**	**Credit 1.0**

Contents:
This course aims to develop more advanced competencies in international students of English language in reading, writing and comprehending more complex sentence structures, grammatical forms and cohesion. It will lay emphasis on awareness of better precision and fluency of structure, forms and style. It will teach organization of paragraph, noting salient points, summarizing, writing advanced discourse, reports and stories on familiar and unfamiliar subjects. It will also teach different forms of writing letters, telegrams and applications, besides reporting speeches in indirect forms. It will involve advanced listening and speaking, role-playing, interpreting, discussing, interviewing etc.

Math 4241	**Integral Calculus and Differential Equations**	**4-0**	**Credit 4.0**

Contents:

Integral Calculus: Definitions of integration, Integration by method of substitution, Integration by the method of successive reduction. Definite integrals. Beta function and Gamma function. Area under a plane curve in Cartesian and Polar co-ordinates. Area of the region enclosed by two curves in Cartesian and Polar co-ordinates, parametric and pedal equations. Intrinsic equation. Volumes of solids of revolution. Volume of hollow solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

Ordinary Differential Equation: Degree and order of ordinary differential equations. Formation of differential equations. Solutions of first order differential equations by various methods, Solutions of general linear equations of second and higher orders with constant coefficients, Solution of homogeneous linear equations. Solution of differential equations of the higher order when the dependent of independent variables are absent. Solution of differential equation by the method based on the factorization of the operators, Frobenius' method, Bessel's and Legendre's differential equations and polynomials.

Partial Differential Equations: Four rules for solving simultaneous equations of the form. Lagrange's method of solving PDE of order one. Integral surfaces passing through a given curve. Nonlinear PDE of order one (complete, particular, singular and general integrals): standard forms $f(p,q)=0$, $z=px+qy+f(p,q)$, $f(p,q,z)=0$ $f_1(x,p)=f_2(y,q)$. Charpit's method. Second order PDE: its nomenclature and classifications to canonical (standard) – parabolic, elliptic, hyperbolic. Solution by separation of variables. Linear PDE with constant coefficients.

Recommended Texts:

1. Calculus with Analytic Geometry, Author: E.W. Swokowski
2. Calculus with Analytic Geometry, Author: H. Anton et. al.
3. Differential Equations, Author S.L. Ross
4. Elementary Treatise on Differential Equations, Author: H.T.H. Piaggio
5. Partial Differential Equations – An Introduction, Author: Bernard Epstein
6. Elements of Partial Differential Equations, Author: Ian N. Sneddon

Chem 4241 Chemistry 3-0 Credit 3.0

Contents:
Atomic structure, quantum numbers, electronic configuration, and periodic table. Properties and uses of noble gases. Different types of chemical bonds and their properties. Molecular structure of compounds. Selective organic reactions. Different types of solutions and their compositions. Phase rule, phase diagram of monocomponent system. Properties of dilute solutions. Thermochemistry, chemical kinetics, chemical equilibria. Ionization of water and pH concept. Electrical properties of solution.

Recommended Texts:
1. Physical Chemistry, Author: Bhall and Tully
2. Inorganic Chemistry, Author: Haider

Chem 4242 Chemistry Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on Chem 4241

CSE 4202 Structured Programming II Lab 0-3 Credit 1.5

Contents:
Experiments based on loop and conditional statement in C, Problem solving using Iterative control statement, Problem Solving with Array, multi-dimensional array and string data structure, Advance string processing tactics, Functions and Recursion, Structures and Unions, Linked List and Dynamic Memory Allocation, problem solving using pointers, File I/O in a Big Program, Standard Template Library (STL), Advanced data types and operators

Recommended Texts:
1. "Programming in ANSI C" by E Balagurusamy, 5E.
2. "Teach Yourself C" by Herbert Schildt.
3. "Let Us C" by Yashavant P. Kanetkar, 5th Edition.
4. Schaum's Outline of "Theory And Problems of Programming With C", 2nd edition.
5. "Art of Programming Contest" by Ahmed Shamsul Arefin, 2nd edition.

Math 4241 Discrete Mathematics 3-0 Credit 3.0

Contents:
Set theory, Elementary number theory, Graph theory, Paths and trees, Generating functions, Algebraic structures, Semigraph, Permutation groups, Binary relations, functions, Mathematical logic, Propositional calculus and predicate calculus.

Recommended Texts:
1. Discrete Mathematics and Application, Author: Rosen
2. Discrete Mathematics, Author: Nicodemi O CBS, 1989
3. Concrete Mathematics, Author: Knuth

CSE 4205 Digital Logic design 3-0 Credit 3.0

Contents:
Number Systems and their conversion, Logic Gates, Boolean algebra, Truth Tables and K-Maps, Karnaugh map logic simplification tool, Combinational circuits analysis and design Sequential Circuit Concept: Introduction to Flip-Flops i.e. J-K F/F, Introduction to Latches, design procedures, introduction to develop state diagram and state table, Structured Sequential Circuits: Registers, shift Registers, parallel Loading of Registers, Counters: synchronous, asynchronous, serial Programmable logic: Random access memory (RAM), Programmable logic Array (PLA).

Recommended Texts:
1. Logic and Computer Design Fundamentals, Author: M. Morris Mano & Charles R Kime.
2. Digital Logic Design, Author: Brian Holdsworth and Clive Woods

CSE 4206 Digital Logic design Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4205

Phy 4241 Physics II 3-0 Credit 3.0

Contents:
Electrical Units and Standards. Electrical Networks, circuit solutions-series, series-parallel networks, loop and Nodal methods. Delta-wye Transformation, Circuit Theorems : Superposition theorem, Thevenen's and Norton's Theorem. Concept of Dual Networks.

Basic principle of generation of Alternating and Direct Current, Introduction to phasor algebra as applied to A.C. circuit analysis. Solution of A.C. circuits: Series, Parallel and Series-Parallel circuit, R.L.C circuits series and parallel resonance. Applications of Networks theorems to A.C. circuits.
The magnetic intensity, flux/density, magnetic effects of Electric current, Magnetic circuit concepts, BH curves, characteristics of magnetic materials, magnetic force and its utilization, Hystersis and eddy current losses, magnetic circuit with A.C. and D.C. excitation.

Math 4341 Linear Algebra 3-0 Credit 3.0

Contents:

Linear Algebra: Solving $Ax = B$ for square systems by elimination (pivots, multipliers, back substitution, invertibility of A, and factorization into $A = LU$. Complete solution to $Ax = B$ (column space containing b, rank of A, nullspace of A and special solutions to $Ax = 0$ from row reduction). Basis and dimension (bases for the four fundamental subspaces). Least squares solutions (closest line by understanding projections). Orthogonalization by Gram-Schmidt (factorization into $A = QR$).

Properties of determinants (leading to the cofactor formula and the sum over all $n!$ permutations, applications to inverse matrix calculation and volume).

Eigenvalues and eigenvectors (diagonalizing A, computing powers A^k and matrix exponentials to solve difference and differential equations). Symmetric matrices and positive definite matrices (real eigenvalues and orthogonal eigenvectors, tests for $x'Ax > 0$, applications).

Linear transformations and change of basis (connected to the Singular Value Decomposition - orthonormal bases that diagonalize A). Linear algebra in engineering (graphs and networks, Markov matrices, Fourier matrix, Fast Fourier Transform, linear programming).

Recommended Texts:

1. Introduction to Linear Algebra, Author: Gilbert Strang.
2. Elementary Linear Algebra with Applications, Author: Howard Anton and Chris Rorres.
3. Linear Algebra, Author: Werner H. Greub

CSE 4301 Object Oriented Programming 3-0 Credit 3.0

Contents:

C++ programming: Concept of classes and objects, data and module encapsulation; polymorphism, inheritance, sub-typing, Advanced C++ I/O, virtual function; object-oriented design; generic classes, static and dynamic binding, generic classes; exception handling, Namespace and standard template library.

Introduction to J++

Introduction to dot net framework

Recommended Texts:

1. Teach yourself C++, Author: Herbert Schildt Tata McGraw-Hill Publications Ltd.
2. Turbo C++, Author: H. Schildt
3. C++: How to program, Author: Deitel H M and Deitel P J, Prentice-Hall.

CSE 4302 Object Oriented Programming Lab 0-3 Credit 1.5

Contents:

Sessional based on CSE 4301

CSE 4303 Data Structures 3-0 Credit 3.0

Contents:

Introduction to data structures: what & why, Notations, Concept of efficiency. Elementary Data Structures: Arrays, Records & Pointers, Examples of Random Access, Call by Reference, Variable Length Strings, Secondary Storage, and Implementation in Memory. Lists: Concept of Linked Lists.

Lists: The implementation, Sub list, Recursive lists, Variants, Orthogonal lists, Stack & Queue, Sequential & circular implementation of stack & queue, Applications of stack & queue.

Graphs: Breadth-First-Search (BFS), Depth-First-Search (DFS), connected components & topological numbering, Applications.

Trees: Creation & representation, Traversal, Copying, Printing and Arithmetic interpretations of trees.

Memory Management: Uniform size records- explicit release and garbage collection.

Diverse Size Records: Allocation, Compaction.

Searching Techniques: Concept, Searching linked lists and Binary tree search.

Hashing: Extraction, Compression, Division and Multiplication, Collision Resolution: Chaining, Probing.

Collision Resolution, Double hash, ordered hash, Rehash, Radix distribution. Sorting: Discussion and comparison on different kinds of sorting (i.e. Insertion sort, Bubble sort, Quick sort, Selection sort, Merge sort etc.).

Recommended Texts:

1. Edward M. Reingold, "Data Structures".
2. Seymour Lipschutz, "Theory and Problems of Data Structures"

CSE 4304 Data Structures Lab 0-3 Credit 1.5

Contents:
Sessional based on CSE 4303

CSE 4305 Computer Organization and Architecture 3-0 Credit 3.0

Contents:
Components of a computer system: processors, memory, secondary storage devices and media, and other input output devices. Processor organization: registers, buses, multiplexers, decoders, ALUs, clocks, main memory and caches.
Information representation and transfer; instruction and data access methods; the control unit: hardwired and microprogrammed; memory organization, I/O systems, channels, interrupts, DMA. Von Neumann SISD organization. RISC and CISC machines.

Recommended Texts:

1. Computer Architecture and Organization, Author: Hayes J 2nd. Edition McGraw-Hill 1992

CSE 4307 Database Management Systems 3-0 Credit 3.0

Contents:
Overview of database management systems; DBMS file structures; introduction to the relational model; relational algebra, normalization and relational design; ER modeling, object-oriented modeling, advanced features of the relational model; Database Design Language; the hierarchical model; the CODASYL model; alternative data models; physical database design; fourth-generation environment; database administration, database recovery, distributed databases and current trends in the field. Relational query languages: SQL; embedded SQL in a third-generation language (COBOL, C or C++). Transaction management; concurrency control.

Recommended Texts:

1. Database System Concepts, Author: Abraham Silberschatz, Henry F. Korth, S. Sudarshan The McGraw-Hill Companies Ltd.
2. Database System, Author: C.J. Date
3. Fundamentals of Database systems, Author: Elmasri R and Navathe S B, Benjamin-Cummings, 1994.

CSE 4308	**Database Management Systems Lab**	**0-2**	**Credit 1.0**

Contents:
Sessional works based on CSE 4307

EEE 4383	**Electronic Devices and Circuits**	**3-0**	**Credit 3.0**

Contents:
Semiconductors, Junction Diode and characteristics, Bipolar transistor characteristics, Small signal low frequency h parameter model, Hybird pie model. Amplifiers, darlington pairs, introduction to oscillators, differential amplifiers, operational amplifiers, linear application of OPamp, gain, input and output impedance, offset null adjustments, frequency response and noise. Introduction to JFET, MOSFET, PMOS, NMOS and CMOS: biasing and application in switching circuits.
SCR, TRIAC, DIAC, PJT, CRT: characteristics and applications. Introduction to rectifiers, active filters, regulated power supply, stabilizer and UPS.

EEE 4384	**Electronic Devices and Circuits Lab**	**0-3/2**	**Credit 0.75**

Contents:
Sessional works based on EEE 4383

Math 4441	**Probability and Statistics**	**3-0**	**Credit 3.0**

Contents:
Probability Law: Sets, Probabilistic Models, Conditional Probability, Independence, Total Probability Theorem, Bayes' Theorem, Counting.
Discrete Random variables: Probability Mass Functions (PMF), Cumulative Distribution Functions (CDF), Expectation, Variance; Well-known distributions (Uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution. etc.). Continuous Random variables:

Probability Density Functions (PDF), Cumulative Distribution Functions (CDF), Expectation, Variance; Well-known distributions (Uniform distribution, Exponential distribution, Gaussian distribution).
Joint Random Variables: Joint PMFs, PDFs, Conditional Expectation, Covariance, Correlation, Independence of random Variables.
Inferential Statistics and Probability Models, Populations and Samples. Descriptive Statistics: Describing Data Sets, Summarizing Data Sets and Chebyshev's Inequality. The Sample Mean, the Central Limit Theorem, the Sample Variance, Sampling Distributions from a Normal Population. Parameter Estimation: Maximum Likelihood Estimators, Interval Estimates. Hypothesis Testing: Significance Levels, Tests Concerning the Mean of a Normal Population, Hypothesis Tests Concerning the Variance of a Normal Populations. Distribution of the Estimators.

Recommended Texts:
1. Sheldon M. Ross, Probability and Statistics for Engineers and Scientists (4^{th} Edition)
2. Roy D. Yates & David J. Goodman, Probability and Stochastic Process. (2^{nd} Edition)

EEE 4483	**Digital Electronics and Pulse Techniques**	**3-0**	**Credit 3.0**

Contents:
Diode logic gates, Transistor switches, Transistor gates, MOS gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details, Propagation delay, Product and noise immunity, Open collector and high impedance gates, Electronic circuits for flip-flops, Counters and register, Memory systems, PLAs, A/D and D/A converters with applications, S/H circuits, LED, LCD and optically coupled oscillators, Non-linear applications of OP AMPs, Analog switches.
Linear wave shaping: Diode wave shaping techniques, Clipping and Clamping circuits, Comparator circuits, Switching circuits, Pulse transformers, Pulse transmission, Pulse generation, Monostable, bistable and astable Multivibrators, Schmitt trigger, Blocking oscillators and time-base circuit, Timing circuits, Simple voltage sweeps, Linear current sweeps

Recommended Texts:
1. Digital Integrated Electronics, Author: Herbert Taub, Donald L Schilling.
2. Microelectronics, Author: Jacob Millman

EEE 4484 **Digital Electronics and Pulse Techniques Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional based on EEE 4483

CSE 4402 **Visual Programming Lab** **0-3** **Credit 1.5**

Contents:
Introduction of Java. Operators. Class and Method. Access Modifier. Constructor. Control Structure. Methods in Details. Enum. Variable Scope. Method Overloading. Get and Set methods. Garbage Collection. Inheritance. Polymorphism. Abstract Class and Methods. Final Methods. Interfaces. Swing Components: Jbuttton, Jcombobox, Jcheckbox, Jradiobutto. Event Handling. Applets. Database Connection (Basic).

Recommended Text:
1. Java How to Program (9^{th} Edition). By Deitel and Deitel.

CSE 4403 **Algorithms** **3-0** **Credit 3.0**

Contents:
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, graph algorithms, Algebraic simplification and transformations, lower bound theory, NP-hard and NP-complete problems.

Recommended Texts:
1. Algorithms, Author: Corman
2. Computer Algorithms, Author: Horowitz E and Sahni S , Galgotia

CSE 4404 **Algorithms Lab** **0-2** **Credit 1.0**

Contents:
Sessional works based on CSE 4403

CSE 4405 **Data and Telecommunications** **4-0** **Credit 4.0**

Contents:
Basic concepts: Concepts and Terminology, Data representation, Data flow, Networks and network models, Protocol and standards, OSI reference model, TCP/IP protocol suite.

Data and signals: Analog and Digital data, Time and frequency domain concepts; Transmission impairment; Noisy and Noiseless channel.
Digital and Analog Transmission: Line coding scheme; Pulse code modulation; Delta Modulation; Amplitude shift keying; Frequency shift keying; Phase shift keying; Amplitude, Frequency and Phase modulation.
Multiplexing: Frequency-division multiplexing; Wavelength-division multiplexing; Time-division multiplexing, spread spectrum; Frequency hopping and Direct sequence spread spectrum.
Multiple Access Techniques: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access(Reservation, Polling, Token Passing) Channelization (FDMA, TDMA, SDMA, OFDMA, CDMA)
Transmission Media: Guided media-Twisted pair cable; Coaxial cable; Fiber-optic cable; Unguided media- Radio wave; Microwave; Infrared and satellite communication.
Switching Network: Circuit switching network; Space and Time division switching; Control signaling; Soft switch architecture; Packet switching; Packet switching technique; Datagram and virtual circuit packet switching.
Error Detection and Correction: Types of error; Block coding; Linear block codes; Hamming code; Cyclic code Convolution codes; Trellis code.
Data link Control Protocols: Flow control; Error control; High level data link control.
Mobile communication: GSM Architecture, CDMA Architecture Cellular concept: Frequency reuse; Handoff; Channel assignment; Co-channel and adjacent channel interference; Cluster size; Cell size; Coverage; Capacity; Cell splitting, Sectoring, Power control, Frequency hopping.
Radio Propagation and channel modeling: Signal propagation mechanisms; Multipath propagation characteristics; Signal fading; Pathloss; Propagation models: Radio wave propagation modeling; Free space propagation model; Radio wave reflection: Ground reflection model; Diffractions; Scattering; Deterministic model; Outdoor propagation model: Okumura model, Hata model;

Recommended Texts:

1. Data Communication and Networking, Author: Behrouz A. Forouzan
2. Wireless communication Author: Rappaport
3. Wireless & Mobile Network Architectures Author: Yi bing Lin
4. Principles and Applications of GSM, Author: Vijay K. Garg, Joseph E. Wilkes

CSE 4407 System Analysis and Design 2-0 Credit 2.0

Contents:
System concepts, System and System analysis, system planning, approach to systems development, user involvement, feasibility assessment. System investigations: objectives, methods, recording. Logic System Design, Physical Design of computer and manual sub-system, project management and documentation.
Software Project Management: life cycle, specification design, documentation, maintenance and control. Nature and sources of software tools. Program system organization, analysis of program performance, testing and verification methods, editing formatting, Microprocessing co-ordination of multiple programs.

Recommended Texts:
1. System analysis and design Author: Kendal & Kendal
2. System analysis and design Author: Awad

CSE 4408 System Analysis and Design Lab 0-2 Credit 1.0

Contents:
Sessional works based on CSE 4407

Hum 4441 Engineering Ethics 3-0 Credit 3.0

Contents:
Introduction to Engineering ethics and professionalism: What is engineering ethics? Why study engineering ethics? Responsible Professionals, Professions, and Corporations, The Origins of Ethical Thought, Ethics and the Law,
Moral Reasoning and Codes of Ethics: Ethical decision-making strategies, Ethical dilemmas, Codes of ethics, Case studies
Moral Frameworks for Engineering Ethics: Ethical theories, Personal commitments and professional life,
Ethical Problem-Solving Techniques:Analysis of Issues in Ethical Problems, An Application of Problem-Solving Methods
Engineering as Social Experimentation :Engineering as Experimentation, Engineers as Responsible Experimenters
Risk, Safety, and Accidents: Assessment of safety and risk, Design considerations, uncertainty, Risk-benefit analysis, safe-exit and fail safe systems

Engineer's Responsibilities and Rights: Employee/employer rights and responsibilities, Confidentiality and conflict of interest, Whistle-blowing, Case studies on whistle-blowing
Honesty and Research Integrity: Truthfulness, Trustworthiness, Research Integrity, Protecting Research Subjects
Computer Ethics: The Internet and Free Speech, Power Relationships, Property, Privacy, Additional Issues
Environmental Ethics: Engineering, ecology, economics, Sustainable development, Ethical frameworks
Global Issues: Multinational corporations, globalization of engineering, Technology transfer, appropriate technology
Cautious Optimism and Moral Leadership: Cautious optimism as a technology development attitude, Moral leadership in engineering

Recommended Texts:

1. Charles B. Fleddermann, "Engineering Ethics", Fourth Edition, 2012.
2. Mike W. Martin, Roland Schinzinger, "Introduction to Engineering Ethics", Second Edition, 2010

CSE 4501 Operating Systems 3-0 Credit 3.0

Contents:

Types of operating systems: single user, real-time, batch, multiple access. Principles of operating systems; design objectives; sequential processes; concurrent processes, concurrency, functional mutual exclusion, processor co-operation and deadlocks, processor management. Control and scheduling of large information processing systems. Resource allocation, dispatching, processor access methods, job control languages. Memory management, memory addressing, paging and store multiplexing. Multiprocessing and time sharing, batch processing. Scheduling algorithms, file systems, protection and security; design and implementation methodology, performance evaluations and case studies.

Recommended Texts:

1. Operating System Concepts, Author: Silberchatz
2. Modern Operating Systems, Author: Tanenbaum A S, Prentice Hall, 1992

CSE 4502 Operating Systems Lab 0-2 Credit 1.0

Contents:

Sessional works based on CSE 4501

CSE 4503	**Microprocessor and Assembly Language**	**3-0**	**Credit 3.0**

Contents:
Microprocessor and Assembly Language: Microprocessors and Microcomputers, Evaluation of Microprocessors Applications, Intel 8086 Microprocessor : internal architecture, register structure, programming model, addressing modes, instruction set, Assembly language programming, Coprocessors. An overview of Intel 80186, 80286, 80386, 80486 and Pentium microprocessors, RISC processors.

Recommended Texts:
1. Microprocessor & Interfacing, Author: V. Hall
2. Assembly Language Programming and Organization of the IBM PC, Author: Ytha Yu, Charles Marut
3. Microprocessor,architecture, programming & application, Author: Gaonkar
4. The Intel Microprocessor 8086…Arch. Prog, Interfacing. Author: Bary, Bray

CSE 4504	**Microprocessor and Assembly Language Lab**	**0-3/2**	**Credit 0.75**

Contents:
Sessional works based on CSE 4503

CSE 4508	**RDBMS Programming Lab**	**0-3**	**Credit 1.5**

Contents:
Relational Database Programming: Introduction. Its role in S/W development. Relational Database Basic Constructs: Table, Keys, Views, Cardinality. Introduction to SQL. Relational query and sub-query. Redundancy and Functional composition in Database. Concept of Joins: Natural joins.
View: its usage and restrictions. Introduction to PL/SQL. PL/SQL Control Structures. Functions and Procedures. Introduction to Cursor. Records. Transaction Management. Oracle Collection. Large Objects. PL/SQL Package. Database Triggers. Dynamic SQL. Introduction to Database Administration. Database Performance Tuning. Brief Introduction to other Relational Databases such as : MySQL, PostGRE, MS SQL Server.

Recommended Texts:
1. Oracle Database 10g/11g PL/SQL Programming. By: Scott Urman and et el.

CSE 4510 Software Development 0-3/2 Credit 0.75

Contents:
Over that last five years or so, the software industry has begun to explore lightweight development methodologies as alternative approaches for building software. These so-called "agile" methodologies emphasize the value of people -- programmers and clients -- over rigid processes. In this course, several of these agile methodologies will be studied and evaluated. Real programming projects will be implemented. An important part of trying them out will be to use some of the of the interesting new tools that support agile methods, such as:
unit testing frameworks, such as jUnit
refactoring browsers, such as Eclipse and IntelliJ's IDEA
build management tools such as Ant and make

Recommended Texts:
1. The Pragmatic Programmer Author: Andrew Hunt and David Thomas.
2. Extreme Programming Explained: Embrace Changes Author: Kent Beck.
3. Agile Software Development: Principles, Patterns, and Practices Author: Rober

CSE 4590 Industrial Training 0-2* Credit 1.0

* 4 weeks

CSE 4531 E-commerce and Web Security 3-0 Credit 3.0

Contents:
E-commerce Business Models and Concepts: Identify the key components of e-commerce business models, B2C business models, major B2B business models, Recognize business models in other emerging areas of e-commerce, key business concepts and strategies applicable to e-commerce.
The Internet and World Wide Web: E-commerce Infrastructure: The origins of the Internet, Key technology concepts behind the Internet, Role of Internet protocols and utility programs, Current structure of the Internet, How the World Wide Web works, How Internet and Web features and services support e-commerce.
E-commerce Marketing concept: Identify the key features of the Internet audience, Basic concepts of consumer behavior and purchasing decisions, Understanding how consumers behave online, Basic marketing concepts needed to understand Internet marketing, Main technologies that support online marketing.

Ethical, Social, and Political Issues in E-commerce: Main ethical, social, and political issues raised by e-commerce, A process for analyzing ethical dilemmas, Basic concepts related to privacy, Practices of e-commerce companies that threaten privacy, Different methods used to protect online privacy, Major public safety and welfare issues raised by e-commerce.
Online Security and Payment Systems: Scope of e-commerce crime and security problems, Key dimensions of e-commerce security, Key security threats in the e-commerce environment, How technology helps protect the security of messages sent over the Internet, Tools used to establish secure Internet communications channels, and protect networks, servers, and clients, Features of traditional payment systems, The major e-commerce payment mechanisms.

Recommended Texts:

1. E-Commerce 2011, Author: Kenneth Laudon , Carol Guercio Traver.
2. Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners, Author: Jason Andress, Steve Winterfeld

CSE 4537 Decision Support Systems 3-0 Credit 3.0

Contents:

An introduction to computer-based decision support. The nature of management, theories of decision making, approaches to decision support, decision support technologies, the development of decision support systems, executive information systems, and group decision support systems. Assessment will include the development of a small decision support system using common spreadsheet software to illustrate the concepts presented in lectures. Students will be expected to spend a significant amount of personal study time early in the semester learning the software and developing skills in representing decision situations.

Recommended Texts:

1. Readings in decision support Systems, Author: Arnott D H and O'Donnell P A (eds.), 2nd Edn, Monash U, 1994

CSE 4539 Web Programming 3-0 Credit 3.0

Contents:

Introduction: The Internet model, Web browsers, Useful tools, Layers of the Internet World Wide Web, Domain Name Service , Uniform Resource Locator , Overview of Web Applications.
Web programming using HTML and xHTML: History of Markup Language, HTML Basics, Tags, Formatting Text, Creating Links, Adding Images, Lists, Tables, Frames, Forms, Cascading Style Sheets (CSS), Graphics.

Javascript: Introduction to javascript, Javascript syntax, Variables, Simple functions.
PHP: Generating HTML Dynamically, Processing Forms, Maintaining State in Web Applications, Cookies, Data Tier, Back-end Database Support, SQL Primer, Database Interface in PHP, Searching in Web Applications, Regular Expressions and Matching, Multimedia and Interactivity, Audio on the Web, Video on the Web
Advanced tools: AJAX, Flash, Flex.

Recommended Texts:

1. Learning Web Design: A Beginner's Guide to (X) HTML, StyleSheets, and Web Graphics Author: Aaron Gustafson.
2. PHP and MySQL Web Development., Author: Laura Thomson.
3. Learning JavaScript, Author:Shelley Powers.
4. Professional ASP.NET 2.0 AJAX., Author:Dan Wahlin.
5. AJAX and PHP: Building Modern Web Applications. Author: Cristian Darie

CSE 4540 **Web Programming Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional based on CSE 4539

CSE 4543 **Geographical Information Systems** **3-0** **Credit 3.0**

Contents:
The subject aims to introduce students to the key basic principles and techniques used in the development of geographical information systems. It has a particularly strong focus on the application of GIS in practice and the evolution of approaches to their development and use. The main topics addressed include introduction to GIS concepts, basic hardware, software and data requirements for GIS development, evolution of GIS technology, key areas of application of GIS in practice, issues in the management of GIS, the organizational role of GIS, and emerging trends in GIS development and usage.

CSE 4544 **Geographical Information Systems Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4543

CSE 4513 **Software Engineering and Object Oriented Design** **3-0** **Credit 3.0**

Contents:
Software Engineering principles, Life cycle models, Sizing, Estimation, Planning and control, Requirements Specification, 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.
Object oriented concepts, Abstraction and modeling; Object modeling - Identification, Classification, Association, Generalization and Aggregation, Inheritance, Meta-data and Notation for object modeling; Use case, dynamic modeling - State transition diagrams and object life cycles; State chart, class diagram, Design pattern, Object oriented development methodologies - Object modeling technique, Object oriented analysis, Object oriented design; Object communication models; and Integration of models.

Recommended Texts:
1. Software Engineering a practitioner's approach, Author: Roger S. Pressman Fourth edition, McGraw-Hill Book Company
2. Object Oriented Modeling and Design, Author: Raumbugh
3. Unified Modeling system, Author: Raumbugh
4. Applying UML and Patterns, Author: Craig larman
5. Object oriented analysis and design Using UML Author: Bennet Farmer
6. Design Pattern, Author: Gamma, Helm & Jhonson

CSE 4511 **Computer Networks** **3-0** **Credit 3.0**

Contents:
Introduction to computer networks, Uses of computer networks, Network models, Network topology, Layered approach of networking protocols, Design issues of layers, and TCP/IP protocol suite.
Data link layer: Design issues; error control, detection and correction; Logical link control sub-layer, Medium access sub-layer; Multiple access protocols, Medium access mechanisms – ALOHA, slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, WDMA; Medium access protocols – IEEE 802.3: Ethernet, IEEE 802.4: Token bus, IEEE 802.5: Token ring, Introduction to WiFi; High speed LANs, FDDI, Fast Ethernet, and Gigabit Ethernet; LAN extension – Bridges, Switches, and VPN, Network layer: IP addressing, IP packet forwarding, Subnetting, CIDR, Internet protocol, ICMP, ARP, RARP, DHCP, and IPv6 overview; Routing protocols -

Transport layer: Functionalities; User datagram protocol (UDP) – UDP operations and UDP package modules, Transmission control protocol (TCP) – TCP features, TCP Connection establishment and termination, TCP Flow control and error control, Congestion control.
Application layer: DNS, Electronic mail (SMTP, POP, IMAP), FTP, WWW.

Recommended Texts:

1. Data Communications and Networking, Author: Behrouz A Forouzan
2. Computer Networks a System Approach, Author: Larry L. Peterson and Bruce S. Davie
3. Computer Networks, Author: Tanenbaum A S

CSE 4512	**Computer Networks Lab**	**0-3**	**Credit 1.5**

Contents:
Sessional works based on CSE 4511

Math 4541	**Multivariable Calculus and Complex Variables**	**3-0**	**Credit 3.0**

Contents:
Complex Variable: Review of analytic functions and Cauchy-Riemann equations, Paths in the complex plane, parameterization, contours, Contour integrals, re-parameterization, Cauchy's theorem, Cauchy integral formula, Liouville's theorem and fundamental theorem of algebra, Laurent and Taylor series, Singularities, residues and the residue theorem, Evaluation of real integrals
Multivariable calculus: Vectors in the plane, Vectors in three dimensions, Dot products, Cross products, Lines and curves in space, Calculus of vector-valued functions, Motion in space, Length of curves, Curvature and normal vectors
Plane and surfaces, Graph and level curves, Limits and continuity, Partial derivatives, The chain rule, Directional derivatives and the gradient, Tangent planes and linear approximation, Maximum/minimum problems, Lagrange multipliers
Double integrals over rectangular regions, Double integrals over general regions, Double integrals over Polar Regions, Triple integrals, Triple integrals in cylindrical and spherical coordinates, Integrals for mass calculations, Change of variables in multiple integral

Recommended Texts:

1. Brown J W & Churchill R V, Complex Variables and Applications (McGraw–Hill)

2. Thomas' Calculus, Multivariable, 12th Edition by George B. Thomas Jr., Maurice D. Weir & Joel R. Hass

CSE 4551	Computer Graphics and Multimedia Systems	3-0	Credit 3.0

Contents:

Introduction to computer graphics: brief history, applications, hardware and software and the fundamental ideas behind modern computer graphics.

Two dimensional graphics: device-independent programming; graphics primitives and attributes.

Interactive graphics: physical input devices, event-driven input; user interface. Transformations; translation, rotation, scaling, shear.

Three-dimensional graphics: 3D curves and surfaces; projections.

Multimedia System Architecture. Objects for Multimedia System: Text; Images and graphics: Basic concepts, Computer image processing; Sound/ Audio: Basic concepts, Music, MIDI, Speech; Video and animation: Basic concepts, Computer-based animation

Data Compression Techniques: JPEG; H.261 (px64); MPEG; Intel's DVI; Microsoft AVI; Audio compression; Fractal compression

Multimedia File Standards: RTF; TIFF; RIFF; MIDI; JPEG DIB; AVI Indeo; MPEG.

Multimedia Storage and Retrieval Technology: Magnetic media technology; Optical media technology: Basic technology, CD Digital audio, CD-ROM, its architecture and further development, CD-Write only (CD-WO), CD-Magnetic optical (CD-MO).

Architecture and Multimedia Communication Systems: Pen input; Video and image display systems; Specialized processors: DSP; Memory systems; Multimedia board solutions; Multimedia communication system; Multimedia database system (MDBMS)

User Interfaces: General design; Video and Audio at the user interface

Multimedia Applications: Imaging; Image/Voice processing and recognition; Optical character recognition; Communication: Tele-service, Messaging; Entertainment: Virtual reality, Interactive audio and video, Games.

Recommended Texts:

1. Introduction to Computer Graphics, Author: Foley J D and others
2. Computer Graphics, Author: Angel E
3. Computer Graphics, Author: Hearn D and Baker M P
4. Multimedia systems, Author: Stimetz
5. Multimedia: Computing, Communications & Applications, Author: Ralf Steinmetz and Klara Nahrstedt
6. Multimedia Systems Design, Author: Prabhat K. Andleigh and Kiran Thakrar

CSE 4552 **Computer Graphics and Multimedia Systems Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4551

CSE 4549 **Simulation and Modeling** **3-0** **Credit 3.0**

Contents:
Introduction and basic simulation procedures. Model classification like Monte Carlo simulation, discrete-event simulation, continuous system simulation, mixed continuous/ discrete-event simulation, Simulation Languages, random number generation and testing, analysis of simulation results, confidence intervals, variance reduction techniques. Case studies of analytical and simulation studies of computer systems.
Analytical versus simulation modeling, Workload modeling, Random variables. Commonly used distributions. Stochastic processes, Markov chain models of computer systems, steady-state and transient analyses, queuing models, Single server and multi-server queues, open and closed queuing networks. model verification and validation, Petri nets, state charts, hybrid models, system dynamics and object-oriented modeling. Simulation and modeling in life.
Input and output analysis: random numbers, generating and analyzing random numbers, sample generation, trace- and execution-driven simulation, point and interval estimation. Process-oriented and parallel and component simulation and modeling
Performance evaluation methods, Performance measurement and benchmarking, workload characterization, the representation of measurement data, instrumentation: software monitors, hardware monitors, capacity planning, bottleneck detection, system and program tuning, simulation and analytical models and their application, case studies.

Recommended Texts:
1. The Art of Computer Systems Performance Analysis, Author: Raj Jain
2. Probability and Statistics with Reliability, Queueing and computer science Applications, Author: Trivedi, K.S
3. Simulation Modeling and Analysis, Author: Law, A.M, and Kelton, W.D

CSE 4550 **Simulation and Modeling Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4549

CSE 4533 **Parallel and Distributed Processing** **3-0** **Credit 3.0**

Contents:

Parallel processing: Importance, architecture, hardware and software issues, Architecture for parallel processing, classification, comparative study of different architecture, hardware issues of parallel processing

Distributed processing: Definition, impact of distributed processing on organizations, pitfalls in distributed processing.

Forms of distributed processing: Function distribution, Hierarchical distributed systems, Horizontal distributed systems, strategies of distributed data processing, control of complexity, problem of incompatibility, centralisation vs. Decentralisation, design of distributed data, location of data, multiple copies of data, conflict analysis.

Multiprocessing Control and Algorithm, Multiple Architecture and Processing, Data flow Computation and VLSI Computation.

Recommended Texts:

1. Computer Architecture and Parallel Processing, Author: Kai Hwang and Faye A. Briggs, McGraw-Hill Book Company

CSE 4600 **Project/ Thesis** **0-6** **Credit 3.0**

CSE 4651 **UNIX Programming** **3-0** **Credit 3.0**

Contents:

Introduction to UNIX, History, Layering, OSI Model, UNIX Model.

C Programming tools in UNIX, The C Language, single and multi module programme, UNIX file dependency system, UNIX Archive System, UNIX Source Code Control System, UNIX profiler, Unix Debugging, System Programming

Inter process Communication, Communication Protocols, TCP/IP, XNS, SNA, NetBIOS and OSI Protocols, UUCP, Berkley Sockets, Unix Domain Protocols, Socket Addresses, elementary and advanced socket UNIX Shells, Shell functionality, systems calls, System verses Transport Layer Interface, Transport Endpoint addresses, elementary a and advanced TLI functions, I/O Multiplexing, Library Routines, time and Date Routines, Ping Routines.

Recommended Texts:

1. UNIX: for programmers and users, Author: Graham Glass, Prentice Hall of India

2. UNIX Network Programming, Author: W. Richard Stevens, Prentice Hall of India
3. The 'C' Odyssey Unix Author: Vijay Mukhi, Meeta Gandhi

CSE 4652 UNIX Programming Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4651

CSE 4610 Design Project 0-3 Credit 1.5

Contents:
Students will develop some projects based on previously acquired subject knowledge

CSE 4614 Technical Report Writing 0-3/2 Credit 0.75

Contents:
Issues of technical writing and effective oral presentation in Computer Science and Engineering; Writing styles of definitions, propositions, theorems and proofs; Preparation of reports, research papers, theses and books: abstract, preface, contents, bibliography and index; Writing of book reviews and referee reports; Writing tools: LATEX; Diagram drawing software; presentation tools; Definition of plagiarism; Types of plagiarism; How to detect plagiarism; Plagiarism and world wide web; How to avoid plagiarism.

Recommended Texts:
1. Writing and presenting reports, Author: Eunson B, John Wiley 1994
2. Writing Tools: 50 Essential Strategies for Every, Author: Roy Peter Clark
3. How to Write Technical Reports: Understandable Structure, Good Design, Convincing Presentation, Author: Lutz Hering, Heike Hering
4. LaTeX: A Document Preparation Systemk Author: Leslie Lamport

CSE 4635 Web Architecture 3-0 Credit 3.0

Contents:
The objective of this course is to introduce and explain the basic concepts of web architecture. Students of this course assume to have prior knowledge of computer network and programming languages as the prerequisite. A reasonable familiarity of java programming will be the added advantage. Throughout the course, the introductory concepts of web architectures for developing web applications will be studied. Students will learn how to write

Java applications that share data across the Internet for games, collaboration, software updates, file transfer and more. A behind-the-scenes look at HTTP, CGI, Servlets, Enterprise Java Beans, ORM, which supports the Internet and the Web will be provided. This course explores the knowledge and the tools to create the next generation software that takes full advantage of the Internet.

Recommended Texts:

1. Great Web Architecture Author: Clay Andres
2. Web Application Architecture: Principles, Protocols and Practices Author: Leon Shklar

CSE 4636 Web Architecture Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4635

CSE 4619 Peripherals and Interfacing 3-0 Credit 3.0

Contents:

Interrupts, address space partitioning, A-to-D and D-to-A converters and some related chips. Interfacing ICs of I/O devices – I/O ports, Programmable peripheral interface, DMA controller, interrupt controller, communication interface, interval time, etc. IEEE 488 and other buses, interfacing with microcomputer. Interfacing I/O devices – floppy disk, hard disk, tape, CD-ROM & other optical memory, keyboard, mouse, monitor, plotter, scanner, etc. Microprocessor in Scientific Instruments and other applications – Display, Protective Relays, Measurements of Electrical quantities, Temperature monitoring system, water level indicator, motor speed controller, Traffic light controller, etc.Microprocessor based interface design

Recommended Texts:

1. Computer Peripherals, Author: KlilKinm
2. Embedded system design, Author: P. Marwedel
3. Embedded System Design: An Introduction to Processes, Tools and Techniques, Author: Arnold Berger, Arnold S. Berger

CSE 4620 Peripherals and Interfacing Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4619

CSE 4641 Distributed Operating Systems 3-0 Credit 3.0

Contents:
Introduction to Distributed Systems Communication in Distributed Systems. Synchronization in Distributed Systems: Clock Synchronization, Mutual Exclusion, Election Algorithms, Atomic Transactions, Deadlocks in Distributed Systems. Processes and Processors in Distributed Systems: Threads, System Models, Processor Allocation, Scheduling in Distributed Systems, Fault tolerance, Real-Time Distributed Systems. Distributed File Systems: Distributed File System Design, Distributed File System Implementation, Trends in Distributed File Systems. Distributed Shared Memory: Consistency Model, Page-Based Distributed Shared Memory, Shared-Variable Distributed Shared Memory, Object-Based Distributed Shared Memory, Comparison.
Case Study: Amoeba, Mach, Chorus.

Recommended Texts:
1. Distributed Operating System, Author: Andrew S. Tanenbaum, Prentice Hall International Edition.

CSE 4642 Distributed Operating Systems Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4641

CSE 4643 Mobile Application Development 3-0 Credit 3.0

Contents:
Basic concepts: Mobile computing; Mobile computing architecture, Mobile technologies, Anatomy of a mobile device, Applications of mobile computing, Technical issues for mobility, Mobile agents and process migration.
Introduction to Mobile Development Frameworks and Tools: Fully Centralized Frameworks and Tools, N-Tier Client–Server Frameworks and Tools, J2ME, WAP, Symbian EPOC, iPhone, Android, Windows CE.
Android application development: Getting started with android programming, Android architecture, Application framework and libraries, Android runtime, Linux kernel, Android user interface, Data persistence, Messaging and networking, Location Based Services, Developing android services, Android application publishing

The User Experience: The Small Screen Problem, The Unified Look and Feel Paradigm, The iPhone Human Interface Guidelines, The Blackberry User Interface Guidelines, Common User Interface Guidelines,
Security Issues in mobile computing: Security threats, Ensuring consistency and reliability.
The Future of Mobile Computing: Upcoming Technologies, Convergence of Media and Communication Devices.

Recommended Texts:

1. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, Cambridge University Press, 2004.
2. Mobile Computing: Theory and Practice: Author: Garg Kumkum
3. Beginning Android Application Development (Wrox Programmer to Programmer), Wrox Press, 2011.
4. Android Application Development: Programming with the Google SDK, O'Reilly, 2009.
5. App Inventor: Create Your Own Android Apps - David Wolber , Hal Abelson, Ellen Spertus, Liz Looney.
6. Wireless Java: Developing with J2ME, 2/e, Jonathan Knudsen, ISBN: 1-59059-077-5, Apress, 2003.
7. Programming Mobile Devices: An Introduction for Practitioners - Tommi Mikkonen, Wiley, 2007.

CSE 4644 **Mobile Application Development Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4643

Math 4645 **Numerical Methods** **3-0** **Credit 3.0**

Contents:
Solution of algebraic and Transcendental equation: Iterative method, Gauss elimination method, Gauss-Seidel method and their applications in Engineering fields.
Interpolation/Extrapolation: Interpolation with one and two independent variables. Formation of different difference table. Newton's forward and backward difference, Lagrange's interpolation, Neville-Aitken's interpolation, Successive iteration.
Numerical Integration: Trapezoidal rule, Gauss's Quadratic formula, Multiple integration, Romberg's method, Truncation and error estimation. Numerical solution of differential equations ,Numerical solution of partial differential equations, curve fitting, Methods of least square, Estimation of linear and nonlinear parameters, formulation, different engineering experimental results.

Recommended Texts:

1. Numerical Analysis, Author: R.L. Burden and J.D. Faires
2. Numerical Methods For Differential Equations: Fundamental Concepts For Scientific & Engineering Applications, Author: M. A. Celia and W.G. Gray
3. Numerical Analysis, Author: L.W. Johnson and R.D. Riess

Math 4646 Numerical Methods Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4645

Hum 4641 Accounting 3-0 Credit 3.0

Contents:

Define Accounting and Book-keeping
Distinguish between Accounting and Book-keeping
Users of Accounting information
Transactions processing, Journalizing, Accounts, Classification.
What are the books of accounts generally prepared by medium and small enterprises. Subdivision of journal. Posting entries into ledger, preparation of ledger accounts. Preparation of ledger accounts. Preparation of sales and purchase day books, sales return and purchase return books, cash books and journal proper. Capital Expenditure and Revenue Expenditure, Capital Receipts and Revenue Receipts. Preparation of Final Accounts including (Manufacturing Accounts) Trading, Profit and Loss Accounts and Balance Sheets and Interpretation and analysis of Balance sheet & income Statement of accounting information in project formulation and appraisal. Cost accounting and elements of cost, preparation of cost sheet showing cost of production, Budget and budgetary control; cost- volume-profit- analysis (Break-even-analysis and Break-even point)

Recommended Texts:

1. Accounting Principles, Weydaudt, Doland Kieso, Paul Kimmel
2. Practice in Accountancy, Sankar Prasad Basu, Monilal Das

CSE 4617 Artificial Intelligence 3-0 Credit 3.0

Contents:

Survey of concepts in artificial intelligence. Knowledge representation, search and control techniques. All machines and features of the LISP and PROLOG languages.

Problem representation: search, inference and learning in intelligent systems; systems for general problems solving, game playing, expert consultation, concept formation and natural language procession: recognition, understanding and translation. Case Study on Expert Systems.

Recommended Texts:

1. Artificial Intelligence: A Modern Approach, Author: Stuart Russell and Peter Norvig

CSE 4618 Artificial Intelligence Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4617

CSE 4615 Wireless Networks 2-0 Credit 2.0

Contents:

Introduction to wireless networks: wireless access networks – wireless mesh networks, personal area networks (wireless sensor networks, body area networks, LowPan, and Bluetooth), wireless and mobile ad hoc networks, challenged networks (DTNs, VANETs).

Wireless MAC protocols: IEEE 802.11, IEEE 802.11e, IEEE 802.11n, IEEE 802.11s, IEEE 802.15.4, S-MAC, B-MAC, IEEE 802.22/20, IEEE 802.16d/e.

Wireless routing: routing matrix – ETX, ETT, WCETT, AirTime Metric, routing protocols – AODV, DSR, DSDV, HWMP, sensor network routing, VANET routing etc.

Wireless Transport protocols; Wireless TCP and its variants, Hop by Hop Congestion Control, Rate based Congestion Control etc. Quality of Service in Wireless Networks.

Recommended Texts:

1. Wireless Communications and Networks, William Stallings
2. IEEE 802 Wireless Systems, B. H. Walke, S. Mangold and L. Berlemann, Wiley

CSE 4616 Wireless Networks Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4615

CSE 4647 Distributed Database Systems 3-0 Credit 3.0

Contents:

Introduction to Distributed Database Systems.

Database System Architecture: Centralized System, Client-Server Systems, Parallel Systems, Distributed Systems, Network Types, Distributed Data Storage, Network Transparency, Data Query Processing, Data Transaction Model, Commit protocols, Coordinator Selection, Concurrency Control, Deadlock Handle, Multi Database system, Design of Distributed Database, Location of Database, Multiple copies of Data, Distributed Database and Applications.

CSE 4648 Distributed Database Systems Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4647

CSE 4631 Digital Signal Processing 3-0 Credit 3.0

Contents:

Classification of signals and systems, signal representation, discrete and analog signals.

Z-transform: Z-transformation, Inverse Z-transformation, Theorems and proposition, syste functions.

Discrete Fourier Transform(DFT): Discrete Fourier Series (DFS), Properties of DFS, Discrete Fourier Transformation (DFT), Properties and application of DFT.

Digital Filter Design Techniques: Differential and difference equations, Digital Transfer Functions, frequency response, Digital filter realization scheme, Finite Impulse response (FIR) Infinite Impulse Response(IIR) filter design.

Application of digital signal processing (DSP): Image processing, Radar systems, Telecommunications etc.

Recommended Texts:

1. Digital Signal processing-Principles,Algorithms and applications, Author: John.G Proakis, Dimitris G. Manolakis

CSE 4632 Digital Signal Processing Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4631

CSE 4649 Systems Programming 3-0 Credit 3.0

Contents:
Concepts of system programming, assembler, compiler, loader, technical design of assembler and compiler, CPU instruction set, OS architecture, device drivers, virus and anti-virus, working principle of virus and anti-virus. Basic concepts of security, security models. Threats to security: areas of vulnerability, physical security, data security, system security, computer system security, communication security, and personal security.
Threat Perpetration: sources, manmade, accidental, thread perpetration measures, identity verification.
Risk assessment workshop and case study, disaster recovery and contingency plan, security management, future of computer security.

Recommended Texts:
1. System software, An Introduction to System programming, Author: Leland L. Beck

CSE 4650 Systems Programming Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4649.

Math 4741 Mathematical Analysis 3-0 Credit 3.0

Contents:
Review of Probability, Random variables;
Stochastic processes, Markov chains and simple queuing theory. Applications to program and algorithms analysis; Computer systems performance and reliability modeling
Renewal Theory, Distribution of N(t), Limit theorems and their applications, Renewal reward process, Semi-Markov process
Techniques and models to develop and demonstrate wide range of problems associated with the design and analysis of various probabilistic systems in Computer Science

Recommended Texts:

1. The Art Of Computer Systems Performance Analysis-by Raj Jain
2. Sheldon M. Ross, Probability and Statistics for Engineers and Scientists (4^{th} Edition)
3. Performance Analysis Of Communications Networks and Systems-by Piet Van Mieghem

CSE 4700 Project/ Thesis 0-6 Credit 3.0

CSE 4703 Theory of Computing 3-0 Credit 3.0

Contents:

Formal methods of automata language and computability, Finite automata and regular expressions, Properties of regular sets, Context-free grammars, Push-down automata, Properties of context-free languages, Turing machines, Halting problem, Undecidability and Computability, Recursion function theory, Chomsky hierarchy, Deterministic context-free languages, Closure properties of families of languages, Computational complexity theory, Intractable problems, Applications in parsing, pattern matching and the design of efficient algorithms.

Finite state machines, Introduction to sequential circuits, basic definition of finite state model, memory elements and their excitation functions, synthesis of synchronous sequential circuits, iterative networks, definition and realization of Moore and Mealey machines.

Recommended Texts:

1. Theory of Computation, Author: Michael Sipser
2. Introduction to Automata Theory, Languages and Computation, Author: Hopcroft and Ullman, Fourth edition, Narosa, 1998
3. Automata and Algebras, Author: Adamek, Kluwer, 1990

CSE 4790 Industrial Training 0-2* Credit 1.0

*4 weeks

CSE 4733 Digital Image Processing 3-0 Credit 3.0

Contents:
Introduction to Signal Processing, Pattern Processing, Computer Graphics, Artificial Intelligence, Human Visual System, Digital Image Representation : Acquision, Storage & Display, Sampling and Quantization, Uniform and Non-uniform Sampling Image Geometry : Perspective Transformation, Synthetic Camera Approach, Stereo Imaging, Image Transform : FFT, PFT, Sine Transformation, Cosine Transformation, Image Enhancement : Spatial and Frequency Domain, Smoothing and Sharpening, Edge Detection, Histogram : Grey Level, Binary Image, Thresh Holding, Half-toning, Image Segmentation : Mathematical Morphology, Dilation and Erosion, Opening and Closing, Image Restoration : Gradation Model, Constrain and Unconstraint Restoration, Inverse Filtering, Wieners Filtering, Image Compression : Source Coding-decoding, Channel Coding-decoding, Practical Image Processing : Electronic Formation of Images, Speed / Memory Problem, Architectures, Decompositions and Algorithms, Computer Implementations for Image Processing Task.

Recommended Texts:
1. Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, Prentice-Hall.
2. Image Processing: Analysis and Machine Vision, M.Sonka, V.Hlavac, R.Boyle Chapman & Hall Computing, 3rd edition, 2007.
3. Image Processing & Computer Vision : Morris, T. (Palgrave Macmillan, 2004)

CSE 4734 Digital Image Processing Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4733

CSE 4735 Digital Systems Design 3-0 Credit 3.0

Contents:
Designing I/O system; I/O devices; Designing Microprocessor based system with interfacing chips; Programmable peripheral interface (interface to A/D and D/A converter); Keyboard/display interface;
Programmable timer; Programmable interrupt controller, DMA controller;
Design using MSI and LSI components; Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: ALU, memory and control unit – hardwired and micro programmed;

Microprocessor based designs; Computer BUS standards; Design special purpose controllers

Recommended Texts:

1. Digital systems design with FPGAs and CPLDs Author: Ian Grout
2. Digital System Design Author: D.A.Godse A.P.Godse

CSE 4736 Digital Systems Design Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4735.

CSE 4753 Bioinformatics 3-0 Credit 3.0

Contents:

Introduction of bioinformatics, Biological analysis, Software development and use of bioinformatics, Data models and web resources.
Tools for informatics, Biological databases and databanks and data mining.
Applications for Bioinformatics, Biostatistics, Various biological databases, Bio tools and computer techniques

Recommended Texts:

1. An Introduction to Bioinformatics Algorithms, Author: Neil C. Jones, Pavel A. Pevzner
2. Bioinformatics for Dummies, Author: Jean-Michel Claverie
3. Bioinformatics: Sequence and Genome Analysis, Author: David W. Mount
4. Statistical Methods in Bioinformatics : An Introduction, Author: Warren J. Ewens, Gregory Grant
5. Developing Bioinformatics Computer Skills, Author: Cynthia Gibas, Per Jambeck

CSE 4754 Bioinformatics Lab 0-3/2 Credit 0.75

Contents:

Sessional Works based on CSE 4753

CSE 4709 Machine Learning 3-0 Credit 3.0

Contents:

Introduction: Defining machine learning, Scalability, Privacy issues and social impact, Applications in AI, Computer vision, Computer games, Search engines, Marketing, Bioinformatics, Robotics, HCI and Graphics.

Graphical models: Introduction to discrete probability, Inference in Bayesian networks, Maximum likelihood and Bayesian learning Model selection.

Supervised learning: Introduction to continuous probability, Linear regression and classification (least squares and ridge), Model assessment and cross-validation, Introduction to optimization, Nonlinear regression (neural nets and Gaussian processes), Boosting and feature selection.

Unsupervised learning: Nearest neighbours and K-means, Spectral kernel methods for clustering and semi-supervised learning. The EM algorithm, Mixture models for discrete and continuous data, Temporal methods: hidden Markov models & Kalman filters, Boltzmann machines and random fields, Examples: web mining, collaborative filtering, music and image clustering, automatic, translation, spam filtering, computer games and object recognition.

Neural Network: Fundamentals of Neural Networks, Back-propagation and related training algorithms, Hebbian learning, Cohen-Grossberg learning, The BAM and the Hopfield Memory, Simulated Annealing, Different type of Neural Networks: Counter-propagation, Probabilistic, Radial Basis Function, Generalized Regression, etc, Adaptive Resonance Theory, Dynamic Systems and Neural Control, The Boltzmann Machine, Self-organizing maps, Spatiotemporal Pattern Classification, The Neocognition, Practical aspects of Neural Networks.

Other forms of learning: Semi-supervised learning, Active learning, Reinforcement learning, Self-taught learning, Evolutionary learning: Genetic algorithm, Genetic programming, CGA.

Recommended Texts:

1. Pattern Recognition and Machine Learning Christopher M. Bishop, Springer, 2006.
2. Reinforcement learning: An introduction, Richard S. Sutton and Andrew G. Barto,MIT Press, 1998.
3. Machine Learning, Tom Mitchell, McGraw-Hill, 1997.
4. Pattern Classification. Second Edition, Richard O. Duda, Peter E. Hart & David G. Stork, Wiley & Sons, 2001.
5. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Second Edition, Springer, 2009.
6. Information Theory, Inference and Learning Algorithms, David J.C. MacKay, Cambridge University Press, 2003.
7. Introduction to Machine Learning, Ethem Alpaydin, MIT Press, 2004.

CSE 4710 **Machine Learning Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4709.

CSE 4743 **Cryptography and Network Security** **3-0** **Credit 3.0**

Contents:
FUNDAMENTALS: OSI security architecture –Security goals- Types of attacks-Cryptography and Cryptanalysis basics -Steganography- Classical encryption techniques – Cipher principles
PRIVATE/SHARED/SYMMETRIC KEY CRYPTOGRAPHY: Data encryption standard (DES) – Block cipher design principles and modes of operation – Evaluation criteria for AES – AES cipher – Triple DES – Placement of encryption function – Traffic confidentiality- Key management- Key distribution center (KDC)
PUBLIC/ASYMMETRIC KEY CRYPTOGRAPHY: Key management – Diffie Hellman key exchange – Elliptic curve architecture and cryptography – Introduction to number theory – Confidentiality using symmetric encryption – Public key cryptography and RSA- Public Key Infrastructure (PKI)-PKI Trust Models- Certificate standard (PKIX and X.509)- Certificate authority (CA)-Certificate revocation.
AUTHENTICATION AND HASH FUNCTION: User authentication/Authentication of people- UNIX password system- Mutual Authentication- Authentication protocols Mediated Authentication (with KDC) - Many to many authentication- Kerberos
Authentication requirements – Authentication functions – Message authentication codes – Hash functions – Security of hash functions and MACS – MD5 Message Digest algorithm – Secure hash algorithm (SHA) – HMAC digital signatures –
Digital signature standard
NETWORK SECURITY: Network layer secrutiy-IP security (IPSec)- Tranasport Layer Security TLS/SSL- Electronic mail security – PGP – S/MIME – Web security -VPN and Multimedia security (SRTP and MIKey)
SYSTEM LEVEL SECURITY: Intrusion detection – Password management – Viruses and related threats – Virus counter measures – Firewall design principles – Trusted systems.

Recommended Texts:

1. Theory and Practice, by Douglas R. Stinson, CRC press
2. Cryptography and Network Security: Principles and Practice by William Stallings , Prentice Hall,
3. Cryptography and Network Security, by Behrouz A Forouzan

4.Network Security: Private Communication in a Public World, Second Edition by Charlie Kaufman , Radia Perlman , Mike Speciner

CSE 4739 Data Mining 3-0 Credit 3.0

Contents:

Introduction and Background: Different types of data and patterns, technologies used. Data Objects and Attribute Types. Basic Statistical Descriptions used in Data-Mining.Data Preprocessing: An Overview. Data Cleaning. Data Integration. Data Reduction. Data Transformation and Data Discretization. Data Warehouse: Basic Concepts. Data Warehouse Modeling: Data Cube and OLAP. Data Warehouse Design and Usage. Data Cube Technology: Concepts. Data Cube Computation Methods. Processing Advanced Kinds of Queries by Exploring Cube Technology. Mining Frequent Patterns, Associations, and Correlations. Classification:Basic Concepts. Decision Tree Induction. Bayes Classification Methods. Rule-Based Classification. Model Evaluation and Selection. Techniques to Improve Classification Accuracy. Cluster Analysis: Basic Concepts and Methods. Partitioning Methods. Hierarchical Methods. Density-Based Methods.

Recommended Texts:

1. Data Mining Concepts and Techniques (Third Edition), By Jiawei Han and et el.

CSE 4749 Introduction to Cloud Computing 3-0 Credit 3.0

Contents:

Fundamentals of cloud computing: Types of cloud computing, enabling technologies-virtualization, Web services, SOA, Web 2.0, cloud computing features, cloud computing platforms; Comparable technologies: Grid Computing, Utility Computing, The role of grid computing in cloud computing, difference between cloud and utility computing. Cloud architecture: Cloud scheduling, Scalability, reliability and security of the cloud, Workflow management in cloud, Network infrastructure for cloud computing, Virtualization technologies and its security related issues; Cloud service Models: Software as a Service (SaaS), Platform as a Service (PaaS), google AppEngine, Microsoft Azure etc, Infrastructure as a Service (IaaS), Openstack, EC2 etc, Data as a Service (DaaS); Cloud computing applications: Virtual private cloud , Scientific services and data management in cloud, Enterprise cloud, Medical information systems; Big Data Introduction: Variety of Data, Velocity of Data, Veracity of Data, Distributed file system such as Hadoop, Data centric computing such as map-reduce, Distributed database.

Cloud business models.

Recommended Texts:

1. Handbook of Cloud Computing, Springer Publicaitons.
2. Understanding Big Data, IBM
3. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet. Kai Hwang, Jack Dongarra & Geoffrey C. Fox.
4. Cloud Computing Principles and Paradigms. R. Buyya, J. Broberg, A. GoscinskiWilley Publications.

CSE 4750	**Introduction to Cloud Computing Lab**	**0-3/2**	**Credit 0.75**

Contents:

Sessional works based on CSE 4749

CSE 4751	**Network Programming**	**3-0**	**Credit 3.0**

Contents:

Basic Networking Software (Protocol stacks, TCP/IP, HTTP, etc) Internet architecture and history, Elementary socket programming in C, Low level networking, Ethernet, ARP, The network layer, IP, DHCP, NAT, The network layer, routing, IPv6, Transport layer protocols, TCP, UDP, The socket interface (writing clients and servers) Advanced socket programming, non-blocking sockets, Server design (forking, threads, preforking), daemons, Network Programming in Java, DNS, email, HTTP, cgi, cookies, P2P Web services (XML, JSP, SOAP, etc) XML, DTDs, Schemas, XML Parsing, XSLT, Client side scripting, Javascript, AJAX, Web server technologies, Tomcat, servlets, Web server technologies, JSP, Web server, technologies, RPCs, Java RMI, XML-RPC, CORBA, Server scripting languages, PHP, Ruby Web services, SOAP, WSDL, UDDI, The Semantic Web, RDF, OWL Network security Cryptography, authentication, digital signatures, Network security, Kerberos, IPSec, SSL, Implementation of security, Anonymity on the Web, tor, Multimedia and VoIP, RTP

Recommended Texts:

1. UNIX Network Programming, Author: Richard Stevens, Volume 1, Second Edition, Sockets and XTI, Prentice Hall, 1998, ISBN 0-13-490012-X.
2. UNIX System Programming using C++, Author: Terrence Chan.
3. The Design of the Unix Operating System, Author: Maurice Bach, Prentice Hall. (Dated description of Unix internals, but very readable)

CSE 4752 **Network Programming Lab** **0-3/2** **Credit 0.75**

Contents:
Sessional works based on CSE 4751

Hum 4731 **Business Communications and Law** **2-0** **Credit 2.0**

Contents:
Communicating in today's workplace, The writing process, Communicating at work, Reporting workplace data, Professionalism, Teamwork, Meeting and speaking skill.
Principles of law of contracts; Company law: law regarding formation, incorporation, management and winding up of companies; Labor law: law in relation to wages hours, health, safety and other condition to work; The trade union legislation arbitration, the policy of the state in relation to labor; The Factory Act (1965); The Law of compensation.
Analytical mode of cyber law in security and society, Cyber law hypothesis, Cyber crime, security in cyber society sector research analysis, security in cyber society cyber law in security, General law & Cyber law, Cyber security and benefits.

Recommended Texts:
1. The business communication handbook Author: Dwyer J, Prentice-Hal 1993
2. Essentials of Business Communication Author: Mary Ellen Guffey, Dana Loewy
3. Cyber Law Author: Anupa Kumar

Hum 4733 **Engineering Economics** **2-0** **Credit 2.0**

Contents:
Definition of Economics, Economics and Engineering, Principles of Economics, Micro-Economics and Macro-Economics.
Micro-Economics: Introduction to various economic systems - Capitalist, Command and Mixed Economy, Fundamental Economic problems and their solutions, Theory of demand, supply and their elasticities, Consumer behaviour theory, Utility analysis approaches – cardinal and ordinal approaches, 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, Maximizing and minimizing economic functions, Relationship among total, marginal and average concepts.
Macro-Economics: Savings, Investment, Employment, National income analysis, Inflation, Monetary Policy, Fiscal policy, Trade policy, Economics of development and planning, Partial equilibrium theory, Representation and Solution theory, Applications in Bangladesh.

Recommended Texts:

1. Economics: A Guide to Reference and Information Sources, Author: Aby, Stephen H, . 3rd edn.
2. The Practice of economics Research, Author: Wadsworth, 10th edition.

Hum 4735 International Relationship 2-0 Credit 2.0

Contents:

An introduction to contemporary analysis of international relations. Students will learn major theories of international relations and apply them to understand international situations and issues in the modern world. Emphases are on clearly comprehending the relationship between international conflicts and cooperation and on recognizing the shift from "internationalization" to "globalization". Extensive use of internet information, articles from professional journals and newspapers will enable students to update information about imminent international issues today and to think about them critically.

Recommended Texts:

1. The Globalization of World Politics: An Introduction to International Relations Author: Baylis, John, Steve Smith, and Patricia Owens. (2011)
2. Essentials of International Relations Author: Mingst, Karen A., and Ivan M. Arreguín-Toft. (5tyh ed. 2010)
3. Perspectives on International Relations: Power, Institutions, Ideas Author: Nau, Henry R. (2008)

CSE 4745 Embedded Systems Design 3-0 Credit 3.0

Contents:

Introduction to Embedded system, The Embedded Design Life Cycle, Models of Computation, State Charts, General language Characteristics (SDL, Petri nets, Message Sequence Charts, UML, JAVA, HDL), Embedded System Hardware,(Input, Communication, Processing Unit, Memories, output) Embedded operating systems, middleware & Scheduling, Implementing, ASIC, Embedded Systems Hardware/Software codesign.

Recommended Texts:

1. Embedded System Design: An Introduction to Processes, Tools and Techniques, Author: Arnold Berger, Arnold S. Berger

CSE 4747 Computational Biology 3-0 Credit 3.0

Contents:

Genomics, Bioinformatics & Molecular Biology, Systematic Literature Search, Human Genome Project, Genome and Sequence Databases, Protein Sequence and Motif Databases, Sequence Alignment, Sequence Similarity Search, Multiple Sequence Alignment, Distance based Phylogenies, Building Protein Motifs and Models, Ab initio Protein Structure Prediction, Clustering Coordinately Regulated Genes, Discovering Gene Regulatory Signals, Gene Regulatory Modules and Networks, MicroRNA Regulatory Networks, Simple Nucleotide Polymorphisms (SNPs), Genome Variations, Genome-Wide Association Studies, Metabolic Pathways and Analyses I, Metabolic Pathways and Analyses II.

CSE 4800 Project/ Thesis 0-6 Credit 3.0

CSE 4801 Compiler Design 3-0 Credit 3.0

Contents:

Introduction to compiler concepts; Compiling techniques including parsing, semantic processing, and optimization; Compiler-compilers and translator writing systems; Scope rules, block structure, and symbol tables; Runtime stack management and run time support; Parameter passing mechanisms; Stack storage organization and templates; Heap storage management; Intermediate code; Code generation Macros; Error management; A small project.

Recommended Texts:

1. Compiler Design, Author: Aho
2. Compiler Design in C, Author: Holub A J, Prentice Hall of India 1993
3. Theory and Practices of Compiler Writing. Author: Trembly and Sorensen

CSE 4802 Compiler Design Lab 0-3/2 Credit 0.75

Contents:
Sessional works based on CSE 4801

CSE 4807 IT Organization and Project Management 3-0 Credit 3.0

Contents:
Management Fundamentals: Managers &, Management, Managing in today's world.
Planning: Foundation of planning and decision making.
Organizing: Basic organization, staffing & human resource management, managing change & innovation.
Leading: Foundations of individual & group behavior, undertaking work teams, motivating & rewarding employees, leadership & trust, communication & inter-personnel skills.
Controlling: Foundation of Control, Technology & Operations.
IT industry Scenario: Study on various types of IT organizations - Software development, Software Testing, Network, ISP, Web development, etc. IT status in various countries, Organisation of an Information Service Centre, organogram, infrastructure, external communication, administration & management scenario of an IT organization.
IT Project Management.

Recommended Texts:
1. Fundamentals of management Author: Stephen P. Robbins, David A. Decenzo.
2. Managing Information Technology Projects, Author: Dick Billows
3. Essential of Project Management, Author: Dick Billows1
4. Project, Planning, Analysis, Financing, Implementation and Review Author: Prasanna Chandra
5. Management of Information Services, Author: Chitra Sivakumar, K S Babai

CSE 4833 VLSI Design and Testing 3-0 Credit 3.0

Contents:
Introduction to basic VLSI design, Design of microelectronic circuits such as registers, technology trends and design automation algorithms, Introduction to CMOS, inverters and basic gates, Brief overview of CMOS fabrication process, layout and design rules, CMOS subsystem, adder and related functions, multipliers, programmable logic arrays via large scale integrated

circuitry with emphasis on high-level structured design methods for VLSI systems.
Hardware modeling: Introduction to HDL, hardware modeling languages, Structural Specification of Hardware, logic networks, state diagrams, data flow and sequencing graphs, behavioral optimization.
Architectural synthesis: Circuit specification, strategies for architectural optimization, data path synthesis, control unit synthesis, synthesis of pipelined circuits.
Testing techniques and algorithms, Various methodologies for testing.
Utilities for High Level Descriptions. Dataflow Descriptions in HDL, HDL Systems, CPU Modeling and Design. Interface Modeling and Design.

Recommended Texts:

1. HDL Analysis and Modeling of Digital Systems, Author: Navabi, Zainalabedin
2. HDL, Author: Perry, Douglas L

CSE 4834 VLSI Design and Testing Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4833

CSE 4835 Pattern Recognition 3-0 Credit 3.0

Contents:

Introduction to pattern recognition, classification, Description. Patterns and Feature extraction. PR approaches, Training and Learning in PR, Common Recognition Problems.
Statistical PR, The gussian case and class dependence, Discriminant Function, classifier performance, Risk and Errors, Supervised Learning, Parametric Estimation and Supervised learning, Maximum likely hood estimation, The Bayesian Parameter Estimation Approach. Supervised Learning Using Non parametric Approaches, Parzen windows.
Linear Discriminant Function and the Discrete and Binary Feature cases, Unsupervised Learning and clustering, Syntactic Pattern Recognition(SPR), Syntactic Pattern Recognition via parsing and other grammars, Graphical approaches to Syntactic Pattern Recognition, Graph based structural presentation, graph Isomorphism, similarity measurements, Learning via grammatical Inference.
Introduction to Neural Recognition and Neural Pattern associators and Matrix approaches.

Recommended Texts:

1. Pattern Recognition : statistical structural and Neural Approaches, Author: Robert J. schalkoff, John Wiley & Sons, Inc. Latest edition

CSE 4836 Pattern Recognition Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4835

CSE 4809 Algorithm Engineering 2-0 Credit 2.0

Contents:

Introduction and review of asymptotic analysis including big-oh notation, divide and conquer algorithms and its application in sorting, matrix multiplication etc., Median finding and selection, interval scheduling, the substitution method, the master method.

Introduction and applications of probability and randomized algorithms, quicksort and its analysis, radix sort, sorting lower bound, hashing, open addressing and amortization, amortized analysis.

The greedy algorithm design paradigms and its applications, dynamic programming design paradigm and its applications.

Graph primitives, BFS, DFS, topological sort in DAGS, all pairs shortest paths, minimum spanning trees and their applications to clustering, heaps and their applications.

Competitive analysis, network flow i.e. max flow and min cut algorithms, interlude: problem solving, van Emde Boas data structure.

Intractable problems and what to do about them, NP-completeness and the P vs. NP question, polynomial time approximations, sublinear-time algorithms, heuristics with provable performance guarantees, Approximation Algorithms, Fast Fourier Transform, local search, Linear Programming, exponential-time algorithms that beat brute-force search.

Recommended Texts:

1. T. Cormen et al., "Introduction to Algorithms," 3rd edition, McGraw-Hill Co., 2009.
2. The Design and Analysis of Algorithms, Anany Levitin, Third Edition, 2012
3. J. McConnell, "Analysis of Algorithms: An Active Learning Approach," 2nd edition, Jones & Bartlett, 2008.

CSE 4810 Algorithm Engineering Lab 0-3/2 Credit 0.75

Contents: Sessional works based on CSE 4809

CSE 4803 Graph Theory 3-0 Credit 3.0

Contents:
Structure and Basic Definition of Graph Theory, methodology, proofs, basic properties of graphs, graph operations and their symbolic designation. Orientation of graphs, associated matrices and their relationship. Groups, automorphism graphs, symmetric graphs, graph enumeration, graph coloring, five color problem, four color conjecture, Heawood map coloring theorem, critical graphs, homomorphism.
Graph algorithms, ordered tree, Huffman tree, catalan numbers, maxflow problem and solutions, maximum matching in bipartite graph, zero-one net flow, NP-complete problems, Eular and Hamilton path and circuit.

Recommended Texts:
1. Graph Theory and applications to engineering and computer science, Author: Narshingh Deo

CSE 4841 Introduction to Optimization 3-0 Credit 3.0

Contents:
Introduction of the principal algorithms for linear, network, discrete, nonlinear, dynamic optimization and optimal control especially their methodology and the underlying mathematical structures. The simplex method, network flow methods, branch and bound and cutting plane methods for discrete optimization, optimality conditions for nonlinear optimization, interior point methods for convex optimization, Newton's method, heuristic methods, and dynamic programming and optimal control methods.

Recommended Texts:
1. An Introduction to Optimization (2^{nd} Edition) By Edwin K.P. Chong and et el.
2. Linear Programming By G. Hadley
3. Linear Programming and Network Flow By Mokhtar S. Bazaraa et el.

CSE 4845 **Introduction to Information Retrieval** **3-0** **Credit 3.0**

Contents:

Introduction: basic structure and major topics of this course, and go over some logistic issues and course requirements

Search engine architecture: basic building blocks of a modern search engine system, including web crawler, basic text analysis techniques, inverted index, query processing, search result interface.

Retrieval models: Retrieval model, a.k.a., ranking algorithm, is arguably the most important component of a retrieval system, and it directly determines search effectiveness. We will discuss classical retrieval models, including Boolean, vector space, probabilistic and language models. We will also introduce the most recent development of learning-based ranking algorithms, i.e., learning-to-rank.

Retrieval evaluation: Assessing the quality of deployed system is essential for retrieval system development. Many different measures for evaluating the performance of information retrieval systems have been proposed. We will discuss both the classical evaluation metrics, e.g., Mean Average Precision, and modern advance, e.g., interleaving.

Relevance feedback: User feedback is important for retrieval systems to evaluate the performance and improve the effectiveness of their service strategies. However, in most practical system, only implicit feedback can be collected from users, e.g., clicks, which are known to be noisy and biased. We will discuss how to properly model implicit user feedback, and enhance retrieval performance via such feedback.

Link analysis: We will discuss the unique characteristic of web: inter-connection, and introduce Google's winning algorithm PageRank. We will also introduce the application of link analysis techniques in a similar domain: social network analysis.

Search applications: We will introduce modern applications in search systems, including recommendation, personalization, and online advertising, if time allows

Recommended Texts:

1. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007.
2. Search Engines: Information Retrieval in Practice. Bruce Croft, Donald Metzler, and Trevor Strohman, Pearson Education, 2009.
3. Modern Information Retrieval. Baeza-Yates Ricardo and Berthier Ribeiro-Neto. 2nd edition, Addison-Wesley, 2011

CSE 4839 Internetworking Protocols 3-0 Credit 3.0

Contents:

Introduction to wireless networks, wireless media, overview of Internet technology, Internet services, electronic mail, UseNet, SNMP, SMTP, URL, URI, HTTP, MIME and WWW.

Multi access protocols; Aloha, CSMA and its variations, token ring; error control techniques, flow and congestion control, window and rate based schemes, TCP. ATM, ABR, hop-by-hop schemes, quality of service: in ATM, IETF integrated services model, differentiated services model, mobile IP, data link layer protocols; routing algorithms and protocols, multicast: IGMP, PIM, DVMRP, spanning tree protocol.

Overview of IEEE 802.11(e/g/h/ac): standard for Wireless Local Area Networks (WLANs), IEEE 802.15: standard for Wireless Personal Area Networks (WPANs), IEEE 802.15.1: standard for Bluetooth, IEEE 802.15.4: standard for ZigBee, IEEE 802.15.5: standard for Mesh Network, IEEE 802.16: standard for Wireless Metropolitan Area Networks (WMANs), IEEE 802.15.5: standard for Mobile Broadband Wireless Access, wireless ATM networks, voice over IP (VoIP), Mobile IP, Internet using mobile phones, roaming algorithms, handover techniques, satellite communications.

Recommended Texts:

1. A.S. Tanenbaum, "Computer Networks", 4th Edition, Prentice Hall, 2002
2. W. Stallings, "Data and Computer Communications", 6th Edition, Prentice Hall, 2000
3. F. Halsall, "Data Communications, Computer Networks and Open Systems", 4th Edition, Addison-Wesley, 1996
4. C. Huitema, "Routing in the Internet", 2nd Edition, Prentice Hall, 1999
5. W.R. Stevens, "TCP/IP Illustrated Volume 1: The Protocols", Addison Wesley, 1994.
6. D. Comer, "Internetworking with TCP/IP Volume 1: Principles Protocols, and Architecture", 4th Edition, Prentice Hall, 2000
7. J.F. Kurose, K.W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Edition, Addison-Wesley 2004.

CSE 4840 Internetworking Protocols Lab 0-3/2 Credit 0.75

Contents:

Sessional works based on CSE 4839

CSE 4847 Information and OS Security 3-0 Credit 3.0

Contents:

Introduction

- Course introduction (syllabus, policies, projects, and recent cyber threats overview)
- An overview of information security: confidentiality, integrity, and availability

Understanding the Threats

- Malicious software (Viruses, trojans, rootkits, worms, botnets)
- Memory exploits (buffer overflow, heap overflow, integer overflow, format string)

Formalisms

- Access control theory, access control matrix
- Information flow

Policy

- Security policies
- Confidentiality policies (BLP model)
- Integrity policies (Biba, and Clark-Wilson model)
- Hybrid policies (Chinese Wall model, role-based access control)

Operating system security

Introduction to operating system security, Understanding the Threats such as Viruses and Worms, Logging, Auditing, and Recovery, OS-level Memory Protection, Virtualization Technology and Applications, Vulnerability Analysis, Malware Capture and Analysis (Honeypots and Honeyfarm), Rootkits

Recommended Texts:

1. Michael Palmer Guide to Operating Systems Security, Course Technology, 2004. ISBN: 0-619-16040-3
2. Matt Bishop Computer Security: Art and Science, Addison Wesley, 2003. ISBN 0-201-44099-7

CSE 4849 Human Computer Interaction 3-0 Credit 3.0

Contents:

Foundations, The Human: Input-output channels, Human memory, Thinking: Reasoning and problem solving, individual Differences, Psychology and the Design of interactive Systems.

The Computer: Text Entry Devices, Output Devices, Memory, Paper : Printing and scanning, processes.

The Interaction : Models of Interaction, Frameworks and HCI, Ergonomics, Interaction styles, The context of the Interaction.
Design Practice: Paradigms for interaction, Principles to support Usability, Using Design Rules, Usability Engineering, Interactive Design and Prototyping, Modules of the user in Design: Cognitive Models, Goal and Task Hierarchies, Linguistic Models. The challenges of Display Based Systems, cognitive Architectures; Task Analysis: Task Decomposition, Knowledge Based Analysis, E-R Based Techniques, Sources Information and Data Collection, Uses of Task Analysis. Dialogues Notations and Design: Dialogue Notations, Textual Dialogue Notations, Dialogue Semantics, Dialogue Analysis and Design; Models of the System: Standard Formalisms, Interaction Models, Status/Event Analysis; Implementation Support; Evaluation Technique; Help and Documentation: Requirements of user support, Approaches to user support, Intelligent help Systems.
Groupware : Groupwave systems, Meeting and Decision support systems, Framework for Grouware.
CSCW Issuses and Theory : Face to Face Communication, conversation.
Multi-sensory Systems : Usable sensory Inputs, speech in the interface, Handwriting Recognition; Text Hypertext and Hypermedia; Gesture Recognition, Computer Vision, Application of Multimedia Systems.

Recommended Texts:
1. Human-Computer Interaction, Author: Alan Dix, Janet Finlay

CSE 4851 Design Pattern 3-0 Credit 3.0

Contents:
This course is an introduction to software design patterns. Each pattern represents a best practice solution to a software problem in a specific context. The course covers the rationale and benefits of object-oriented software design patterns. Numerous problems will be studied to investigate the implementation of good design patterns.
Topics: Strategy, Observer, Factory, Singleton, Command, Adapter, Facade, Template Method, Iterator, Composite, State, Proxy

Recommended Texts:
1. Eric & Elisabeth Freeman: Head First Design Patterns,O'REILLY