PRINCIPAL SUBJECT AREA

COMPUTER SCIENCE

400 LEVEL COURSES

CS 401 Artificial Intelligence and Expert Systems: (3 credits)
(Prerequisite: CS 301)
Artificial intelligence: Intelligent Agents, Search Techniques, Game Playing, Knowledge and Reasoning, First order logic, Logical reasoning systems, Uncertainty, Probabilistic Reasoning, Simple and complex Decisions, Learning.
Expert systems: Characteristics and components of Expert systems, Machine learning, Knowledge base and bank, Rule Knowledge, Inference engine, transit fare rule, Rule interpreter, Inference tree.
Recommended Texts:

1. Russell, S.J; Norvig, P.; *Artificial Intelligence: A Modern Approach*; Prentice-Hall; 1995

CS 402 Intelligent Systems in CIM (2 credits)
(Prerequisite: CS 401)
Introduction to Manufacturing Systems and Computer Integrated Manufacturing (CIM) systems. Components of CIM systems. Computational Intelligencen for Manufacturing. Intelligent systems for Manufacturing. Manufacturing System Modeling and Design. Artificial intelligence in CIM: Process Planning and Scheduling, Manufacturing Process Monitoring and Control, Quality Assuarance and Fault Diagnosis. Robots and tools: modeling industrial manipulators, Kinematics, Dynamics, control, Motion and Grasp planning, Sensor system and sensor fusion.

Recommended Texts:

1. Groover, M.P.; *Automation, Production Systems, and Computer Integrated Manufacturing*; Prentice Hall;1987

CS 404 Parallel Processing: (3 credits)
(Prerequisites: CS 206, CS 303, CS 306)
History and Evolution of parallelism in computers: Overlapping of I/O and computation, Interleaving of memory stacks, Pipeline vector computers, Multiprocessor systems, Flynn's classification of parallel computers, The structure of parallel algorithms, The space of parallel algorithms, Algorithm for synchronous parallel computers, Algorithm for asynchronous parallel computers, Process organization, Types of parallel computers, Designing parallel algorithms.

Recommended Texts:

1. Hwang, K.; Briggs, F; *Computer Architecture and Parallel Processing*; McGraw-Hill; 1984.

CS 406 Foundations of Distributed computing (3 credits)
(Prerequisites: CS 102, CS 305)
Networking: network types, network protocols, packet switching, networking technology, internetworking; Interprocessor communication: communication mechanisms, communication models, client-server communication, group communication, remote procedure calling; Distributed operating systems: issues, building blocks, architecture; Distributed file services: file system, file and directory services, sharing, remote access methods; Name and time services: names and attributes, name services, internet domain name system, time and coordination; Replication: architectural models, consistency and request ordering, ordering implementation, process groups; Transaction processing: transaction properties, concurrency control, fault tolerance and recovery, distributed and nested transactions, concurrency control methods.

Recommended Texts:

1. G. Coulouris, J. Dollimore, T. Kindberg: *Distributed Systems, Concepts and design*, 3rd Edition. Addison-Wesley 2001.

CS 408 Computer Vision (2 Credits)
(Prerequisites: CS 313, CS 314)
Discrete geometry and quantization, length estimations, automated visual inspection, object recognition and matching, depth perception problems, stereo geometry and correspondence, motion analysis, optical flow, applications of Computer Vision, remote sensing, biomedical imaging, document processing, target tracking

Recommended Texts:

1. *Computer Imaging: Digital Image Analysis and Processing* , SE Umbaugh, CRC Press, 2005
2. *Computer Vision: A Modern Approach* by David A. Forsyth and Jean Ponce, Prentice Hall, 2002

CS 409 Neural networks and Fuzzy logics (3 Credits)
(Prerequisities: CS 401)
Fuzzy system models, Fuzziness and certainty, fuzzy sets, basic properties and characteristics, Domains, Alpha- level sets and support sets, Linear representation, Fuzzy set operators, Conventional (crisp) set operations, basic Zadeh type operations, intersection, union and complement of fuzzy sets, General algebraic operations, Fuzzy set hedges, Fuzzy reasoning, linguistic variables, Fuzzy models, Fuzzy systems and modeling, Design methodologies, modeling and utility software. Parallel and distributed processing, Neuron, Connectivity, Activation function, propagation rule, Learning rules, pattern Preparation, Perceptron, Multilayer perceptron, Associative memory, Hopfield neural networks, Self organizing map (SOM), Adaptive Resonance theory, topologies, Training methods, supervised and unsupervised learning

Recommended Texts:
1. *Artificial Intelligence: A Modern Approach* (Second Edition) by Stuart Russell and Peter Norvig.

CS 410 Internet and Multimedia Systems (2 Credits)
(Prerequisites: CS 305)
Introduction and overview: Discrete Cosine Transform Coefficient Coding. *Audio Coding:* Analogue and digital form: Sample rate, bits/sample, nyquist rate, CD audio Compression techniques: - PCM, ADPCM, LPC, GSM/CELP, MP3/AAC. *Video:* TV Standards: Interlacing vs progressive scan, PAL, NTSC, SECAM Video digitization, Raw Image Representation: RGB, YUV411, YUV422, Indexed color vs true color Image Compression: - GIF, JPEG, Motion JPEG: Video Compression: - Motion estimation - Motion compensation Video Compression Schemes: - H.261, H.263 - MPEG 1, MPEG 2, MPEG 4 Video Adaptation: - Sender-side adaptation, buffering, VBR->CBR conversion. *System Streams:* MPEG program and transport streams H.221 framing (for ISDN) IP-based transport: - packet loss - TCP vs. UDP - Application-level framing – RTP - H.261 as example of payload format – DCCP Audio/Video synchronization – RTCP - MPEG system stream. *Signaling:* H.323 SIP and SDP RTSP Megaco. *OS Issues:* Buffering Scheduling. *Describing Network Traffic:* Traffic patterns Application requirements QoS parameters and descritions. *Congestion control and Resource Management:* TCP congestion control Real-time traffic congestion control Queue management: - Random Early Detection + other AQM - Explicit Congection Notification (ECN) - Scheduling mechanisms (FQ, WFQ). *Enhanced Quality of Service:* Intserv Resource reSerVation Protocol (RSVP) Diffserv. *IP Multicast:* Service Model Layered transmission Multicast congestion control. *Digital rights management:* Legal issues Watermarking

Recommended Texts:
1. *Introduction to Multimedia Systems (Communications, Networking and Multimedia)*, by Sugata Mitra and Gaurav Bhatnagar

CS 411 Multimedia practical (1 Credit)
(Prerquisites: CS 410)
Introduction to multimedia packages, sound editing, video editing, 2D and 3D animation design

Recommended Texts:
1. *Introduction to Multimedia Systems (Communications, Networking and Multimedia)*, by Sugata Mitra and Gaurav Bhatnagar

CS 412 Mobile and Pervasive Computing (2 Credits)
(Prerequisites: CS 305, CS 406)
Introduction and overview: A look at the general issues that will be addressed on this module. *Properties of wireless PANs, LANs, WANs:* Basic structure and operation. Ad-hoc and infrastructure networks. Physical constraints and limitations (transmission & reception). Network structures and architectures, including hand-off and mobility support at the physical/link level. *Example technologies at the physical/link layers:* PANs - Bluetooth. LANs - IEEE802.11, HiperLAN. Basic GSM and GPRS (2G/2.5G) network structure and protocol architecture. Next generation wireless overview (3G/4G) including UMTS, IMT-2000 and W-CDMA. *Mobile IP:* Mobile IPv4 and Mobile IPv6. Problems with routing, QoS and security. *Overview of use of intelligence in mobile systems:* Power management, replication, adaptation etc. *Power management issues:* From the lowest (physical device) levels, through communication protocols, broadcast methodologies, transcoding, etc. *File systems, Mobile infrastructure support:* Mobile middleware. Resource/neighbour discovery including peer-to-peer and gossip protocols. *Adaptive and reconfigurable systems, Mobile multimedia and its relationship to proxying, Context sensitive applications, Ubiquitous computing, pervasive computing and ambient networking, Overlay networks and vertical hand-offs, Programmable networking and applications for mobile systems, Code mobility and control/signaling*

Recommended texts:
1. *Mobility: Processes, computers and agents*. Ed. Dejan Milojicic, Frederick Douglis and Richard Wheeler. ACM Press

CS 413 Information and Network Security (2 Credits)
(Prerquisites: CS 305)
Information Security Fundamentals, Attackers and Their Attacks, Security Basics, Security Baselines, Securing the Network Infrastructure, Web Security, Introducing Cryptography, Operational Security, Computer Forensics

Recommended texts:
1. *Security+ Guide To Network Security Fundamentals*; Mark Ciampa, Thompsons, 2004

CS 414 Software Project Management (2 Credits)
(Prerequisites: CS 311)
Project Management Life Cycle, Managing Project Teams, Managing Project Communication, Managing Project Scope, Managing Project Scheduling, Managing Project Resources, Managing Project Quality, Managing Project Risk, Managing Project Execution

Recommended texts:
1. *Information Systems Project Management: A Process and Team Approach*; Mark Fuller, Joe Valacich, and Joey George, Prentice Hall, 2007

CS 415 Industrial Training (3 Credits)
Each student is sent to one of the software industries in Sri Lanka to carry out tasks assigned by the industry. Students are expected to satisfy the requirements of the assigned industry and are required to submit a project report

CS 421 Project in Computer Science II – Individual Project Work (6 credits)
(Prerequisite: CS 311)
The project topic could be selected from any area in the in the Computer Science Special Degree which specified above. The selection of the project is done at the beginning of the year and involves at least 8 hours work per week. The project will be done throughout the year and consist of three progress reports (one for term), a dissertation and oral presentation.

CS 423 Seminar (1 credit)
Compulsory for all special degree students in Computer Science. Each student will be assigned a topic on which he/she is expected to make a presentation.

Note: Students opting to follow the special degree course in computer science are required to select courses from the following course units in addition to fulfill their credit requirements.

MT 207 Combinatrics
MT 209 Graph Theories
ST 102 Introduction to Probability Theory
ST 201 Probability Theory
ST 203 Theory of Statistics