CS010 801 : HIGH PERFORMANCE COMPUTING

Teaching scheme
3 hours lecture and 2 hour tutorial per week

Credits: 4

Objectives
- To design a powerful and cost-effective computer system.
- To provide the basic concepts of parallel processing on high performance computers.

Module I (15 hours)
Introduction to parallel processing - Trends towards parallel processing - Parallelism in uniprocessor - Parallel computer structures - Architecture classification schemes - Amdahl’s law, Indian contribution to parallel processing

Module II (15 hours)
Principles of pipelining and vector processing - Linear pipelining - Classification of pipeline processors - General pipelines - Instruction and Arithmetic pipelines - Design of Pipelined instruction unit - Principles of Designing Pipeline Processors - Instruction prefetch and branch handling - Data Buffering and Busing Structure - Internal forwarding and register tagging - Hazard detection and Resolution - Dynamic pipelines and Reconfigurability

Module III (15 hours)
Array processors - SIMD array processors - Interconnection networks - Static vs dynamic networks - mesh connected networks - Cube interconnection networks - Parallel algorithms for array processors - SIMD matrix multiplication - Parallel sorting on array processors - Associative array processing - Memory organization.

Module IV (15 hours)
Multiprocessor architectures and Programming - Loosely coupled and Tightly coupled multiprocessors - Interconnection networks - Language features to exploit parallelism - Inter process communication mechanism - Process synchronisation mechanisms, synchronization with semaphores.

Module V (15 hours)
Dataflow computers - Data driven computing and Languages, Data flow computers architectures - Static data flow computer, Dynamic data flow computer, Data flow design alternatives.
References:

3. Elements of Parallel computing - V. Rajaraman - PHI
5. Parallel Processing for Super Computers & AI - Kai Hwang & Douglas Degnchot
   McGraw Hill
8. Advanced Computing- Vijay P. Bhatkar, Asok V. Joshi,
   Arirban Basu, Asok K. Sharma.
CS010 802: ARTIFICIAL INTELLIGENCE

Teaching scheme

Credits: 4
2 hours lecture and 2 hour tutorial per week

Objectives

- To provide introduction to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence.
- To familiarize with Fuzzy Logic and knowledge processing in expert systems
- To give exposure to problem solving in AI using Python

Module 1  (14 hours)


Python-Introduction to Python- Lists Dictionaries & Tuples in Python- Python implementation of Hill Climbing

Module 2  (12 hours)


Module 3  (12 hours)

Knowledge representation - Using Predicate logic- representing facts in logic, functions and predicates, Conversion to clause form, Resolution in propositional logic, Resolution in predicate logic, Unification, Question Answering, forward and backward chaining.

Module 4  (12 hours)


Module 5  (10 hours)


References

1. Elaine Rich, Kevin Knight, Shivashankar B Nair
3. George F Luger - Artificial Intelligence, Pearson Education Asia

Web Reference

1. http://code.google.com/p/aima-python/ - Website for search strategy implementation in python
CS010 803: Security in Computing

Teaching scheme
2 hours lecture and 2 hours tutorial per week

Credits: 4

Objectives
- To impart an essential study of computer security issues
- To develop basic knowledge on cryptography
- To impart an essential study of various security mechanisms

Module 1  (12 hours)


Module 2  (12 hours)

Modern Block Ciphers - Fiestel Networks , DES Algorithm – Avalanche Effect.

Introduction to Number Theory - Prime Factorisation, Fermat's Theorem, Euler's Theorem, Primitive Roots, Discrete Logarithms.


Module 3  (12 hours)


Module 4  (12 hours)


Module 5  (12 hours)


Reference Books

CS010 804L01: E-COMMERCE

Teaching scheme
2 hours lecture and 2 hours tutorial per week

Credits: 4

Objectives
- To impart an introduction to Electronic Commerce.
- To develop basic knowledge of Business in Internet and Electronic Payment.

Module I (12 hours)

Module II (14 hours)
Consumer Oriented Electronic Commerce:- Consumer Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer’s Perspective, Mercantile Models from the Merchant’s Perspective

Module III (10 hours)
Electronic Payment Systems :- Types of Electronic Payment Systems, Digital Token Based Electronic Payment System, Smart Cards, Credit Cards, Risk in Electronic Payment Systems, Designing Electronic Payment Systems.

Module IV (12 hours)

Module V (12 hours)

Reference Books
3) P. T. Joseph, E-Commerce An Indian Perspective, PHI Learning Private Limited, New Delhi, 2009
CS010 804L02: GRID COMPUTING  
( Common to IT010 804L06:Grid Computing )

**Teaching scheme**

<table>
<thead>
<tr>
<th>Credits:</th>
<th>4</th>
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<tr>
<td>2 hours lecture and 2 hours tutorial per week</td>
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**Objectives**

- To impart an introduction to Grid Computing.
- To develop basic knowledge about the Open Grid Service Architecture.

**Module I (12 hours)**


**Module II (12 hours)**


**Module III (12 hours)**

Merging the Grid Services Architecture- Service Oriented Architecture- Web Service Architecture- XML relevance to Web Services- Service Message Description Mechanisms- Relationship between Web Service and Grid Service.

**Module IV (12 hours)**


**Module V (12 hours)**


**Reference Books**

CS010 804L03: Bioinformatics

Teaching scheme
2 hours lecture and 2 hour tutorial per week

Credits: 4

Objectives
- To understand the science of storing, extracting, organizing, analysing and interpreting biological data.

Module 1 (12 hours)
Basic Concepts of Molecular Biology: Cells - Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, RNA classification – coding and non coding RNA-mRNA, tRNA, miRNA and sRNA, Genomes and Genes - Genetic code, ORFs, Slice variants, Transcription, Translation and Protein synthesis.

Module 2 (12 hours)
Sequence alignments – local/global, pairwise/multiple Sequence alignment- Smith-Waterman algorithm, Needleman-Wunch algorithm, Multiple sequence alignment – Sum-of-Pairs measure - Star and tree alignments, Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM, Phylogenetic Trees

Module 3 (12 hours)

Module 4 (12 hours)
Evolution of Protein Structures, Classification of Protein Structures- primary, secondary, tertiary and quaternary, Protein Structure prediction and modeling, Assignment of protein structures to genomes, Prediction of protein function, Protein folding problem, Protein Threading, Drug discovery and development.

Module 5 (12 hours)
Biological data bases: Pubmed, Swissport, EMBL, DDBJ, Genbank, Software Tools: Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW

Syllabus- B.Tech. Computer Science & Engg
References

5. Zoe Lacroix, Terence Critchlow “Bioinformatics managing scientific Data”, Morgan Koufmann Publishers
Mahatma Gandhi University

CS010 804L04 : Optimization Techniques

Teaching Schemes Credits: 4
2 hours lecture and 2 hour tutorial per week.

Objectives:
- To understand the need and origin of the optimization methods.
- To get a broad picture of various applications of optimization methods used in engineering.
- To define an optimization problem and its various components.

Module I (12 Hrs)
One Dimensional Unconstrained Minimization techniques, single variable minimization, unimodality, bracketing the minimum, necessary and sufficient conditions for optimality, convexity, steepest descent method.

Module II (12Hrs)
Linear programming, introduction, linear programming problem, linear programming problems involving LE (?) constraints, simplex method, optimality conditions, artificial starting solutions, the M method.

Module III (12hrs)
Transportation models, definition, non traditional models, transportation algorithm, East West corner method, Vogel approximation method. Assignment model, Introduction, Hungarian method.

Module IV (12Hrs)
Forecasting Models, moving average technique, regression method, exponential smoothing. Game Theory, two persons zero sum games, mixed strategy games - graphical method.

Module V (12Hrs)
Queuing models, elements of queuing model, pure birth and death model, specialized Poisson queues, single server models. Multiple server models, self service model.

References:
1. Ashok D Belegundu, Tirupathi R Chandrupatla, optimization concepts and Application in Engineering, pearson Education.

Syllabus- B.Tech. Computer Science & Engg
CS010 804L05: MOBILE COMPUTING

Objectives

- To study the relevance and underlining infrastructure of multimedia system.
- To enable the students to apply contemporary theories of multimedia learning to the development of multimedia products.

Module I (10 hours)
Cellular concepts—channel assignment strategy—hand off strategy—interface and system capacity—trunking—improving coverage and capacity in cellular system.

Module II (12 hours)
Wireless Communication Systems: Telecommunication Systems-GSM-GSM services & features, architecture, channel type, frame structure, signal processing in GSM & DECT-features & characteristics, architecture, functional concepts & radio link, personal access communication system(PACS)-system architecture-radio interface, Protocols. Satellite Systems-GEO, LEO, MEO.

Module III (11 hours)


Module IV (14 hours)

Module V (13 hours)
Wireless Application Protocol & World Wide Web
### References

1. Jochen Schiller “Mobile Communications “ , Preason Education Asia
3. Computer Networks – Andrew S. Tanenbaum, PHI
4. Communication Networks -Fundamental Concepts and Key Architectures
   Leon-Garcia & Indra Widjaja, Tata McGraw Hill
CS010 804L06 : Advanced Networking Trends

Teaching scheme
2 hours lecture and 2 hours tutorial per week

Credits: 4

Objectives
- To acquaint the students with the application of networking.
- To understand the various TCP/IP protocols and the working of ATM and its performance, Network security and authentication, and various algorithms related to it has been dealt, to get a practical approach, advanced topics in the design of computer networks and network protocols

Module 1 (12 hours)
ISDN - Definition - Protocol architecture - System architecture - Transmission channels - ISDN interface, B-ISDN.

Module 2 (12 hours)

Module 3 (12 hours)
Bluetooth – Physical Layer – MAC layer – Networking - Security

Module 4 (12 hours)

Module 5 (12 hours)

References
3. Mobile Communication - Jochen Schiller, Pearson Education Asia
CS010 805G01: MULTIMEDIA TECHNIQUES

Teaching scheme  
2 hours lecture and 2 hours tutorial per week

Credits: 4

Objectives
- To study the relevance and underlining infrastructure of multimedia system.
- To enable the students to apply contemporary theories of multimedia learning to the development of multimedia products.

Module I (10 hours)
Multimedia Basics: Multimedia and Hypermedia, Multimedia Software, Editing and Authoring Tools, VRML.
Graphics and Image Data Representation — Graphics/Image Data Types, Popular File Formats.

Module II (12 hours)

Module III (11 hours)
Image, Video and Audio Compression — Image Compression -JPEG, JPEG-LS.
Basic Video Compression Techniques — Introduction to Video Compression, Video Compression Based on Motion Compensation, MPEG
Video Coding — Audio Compression Techniques — MPEG, ADPCM in Speech Coding, Vocoders, Psychoacoustics, Audio Codecs.

Module IV (14 hours)
Storage and Retrieval of Images — Content-Based Retrieval in Digital Libraries: Image retrieval, CBIRD. A Case Study, Image Search Systems, Quantifying Results, Querying on Videos, Querying on Other Formats, Outlook for Content-Based Retrieval.

Module V (13 hours)
Multimedia Databases
Multimedia Databases — Design and Architecture of a Multimedia Database, Organizing Multimedia Data based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data, Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/Expansion.

References

CS010 805G02 : Neural networks
(Common to IT010 805G05 Neural Networks)

Teaching scheme                  Credits: 4
2 hours lecture and 2 hours tutorial per week

Objectives
To understand the fundamental building blocks of Neural networks

Module 1 (14 hours)
Biological Neurons and Neural Networks, Basic Structures and Properties of Artificial Neural Networks, Basic Neuron Models-McCulloch-Pitts -Nearest Neighbour- Radial Basis Function, Activation Functions ,Singel Layer Perceptrons-Linear seperability, Learning and Generalization in Single Layer Perceptron-Hebbian Learning-Gradient Descent Learning-Widrow-Hoff Learning-The Generalized Delta rule, Practical Considerations

Module 2 (12 hours)

Module 3 (10 hours)

Module 4 (12 hours)

Module 5 (12 hours)
References
1. B. Yegnanarayana, "Artificial Neural Networks", PHI.
2. Simon Haykin, Neural Networks, 2/e, Prentice Hall
3. Neural Computing & Practice – Philip D. Wasserman
4. Neural Networks in Computer Intelligence-Limin Fu,Tata Mc.Hill Edition
CS010 805G03 : Advanced Mathematics

( common to IT010 805G02 Advanced Mathematics )

Teaching Schedule:  Credits: 4

2 hour Lecturer and 2 hour Tutorial per week

Objectives

- To provide an understanding of Green’s Function, Integral Equations, Gamma, Beta functions, Power Series solution of differential equation, Numerical solution of partial differential equations

Module 1 (12 Hours)
Green’s Function

Module 2 (12 Hours)
Integral Equations
Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green’s function – solution of Fredholm integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

Module 3 (12 Hours)
Gamma, Beta functions

Module 4 (12 Hours)
Power Series solution of differential equation
The power series method – Legendre’s Equation – Legendre’s polynomial – Rodrigues formula – generating function – Bessel’s equation – Bessel’s function of the first kind – Orthogonality of Legendre’s Polynomials and Bessel’s functions.

Module 5 (12 Hours)
Numerical solution of partial differential equations
Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson’s equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.
References
8. Bernard Friedman, Principles and Techniques of Applied Mathematics, John Wiley and sons
10. P. Kandasamy, K. Thilagavathy, K. Gunavathy Numerical methods, S.Chand & co
CS010 805G04: Software Architecture
(Common to IT010 805G01  Software Architecture )

Objectives

- To understand the role of a software architecture in the development of an enterprise application system.
- To develop the ability to understand the models that are used to document a software architecture.

Module I (13 hours)

Module II (11 hours)
Architectural Design—Guidelines for User Interface Architectures, Design Space and Rules, Applying Design Space with an Example, A Validation Experiment. The Quantified Design Space—Background, Quantified Design Space.

Module III (11 hours)

Module IV (14 hours)
Architectural Description Languages—Requirements for Architectural Description Languages, The Linguistic Character of Architectural Description, Desiderata for Architecture Description Languages, Problems. First-Class Connectors—Current practice, Software System Composition. Adding Implicit Invocation to Traditional Programming Languages

Module V (11 hours)

References

CS010 805G05: Natural Language Processing

Teaching scheme

2 hours lecture and 2 hours tutorial per week

Objectives

- To acquire a general introduction including the use of state automata for language processing
- To understand the fundamentals of syntax including a basic parse
- To explain advanced feature like feature structures and realistic parsing methodologies
- To explain basic concepts of remotes processing
- To give details about a typical natural language processing applications

Module I (12 hours)


Module II (12 hours)


Module III (12 hours)

Module IV (12 hours)


Module V (12 hours)


References:


CS010 805G06 : Pattern Recognition

Teaching Schemes
2 hours lecture and 2 hours tutorial per week

Credits: 4

Objectives:
• To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.
• To provide a strong foundation to students to understand and design pattern recognition systems.

Module I (12 hours)
Introduction: introduction to statistical, syntactic and descriptive approaches, features and feature extraction, learning and adaptation. Bayes Decision theory, introduction, continuous case, 2-category classification, minimum error rate classification, classifiers. Discriminant functions and decision surfaces.

Module 2 (12 hours)

Module 3 (12 hours)

Module 4 (12 hours)

Module 5 (12 hours)
Syntactic approach to PR: Introduction to pattern grammars and languages, higher dimensional grammars, tree, graph, web, plex, and shape grammars, stochastic grammars, attribute grammars, Parsing techniques, grammatical inference.
<table>
<thead>
<tr>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. R.O Duda, Hart P.E, “Pattern Classification And Scene Analysis”, John Wiley</td>
</tr>
<tr>
<td>4. Fu K.S., “Syntactic Pattern Recognition And Applications”, Prentice Hall,</td>
</tr>
</tbody>
</table>
Objectives

- To acquaint the students with the implementation of fundamental algorithms in Computer Graphics.

I. Experiments to implement the following: (first 3 weeks)

1. DDA Algorithm
2. Bresenham's Line drawing Algorithm for any slope.
3. Mid-point Circle Algorithm.
4. 2D Transformations

II. Experiments to implement the following:

1. 3D Rotations on a cube (about any axis, any general line) controlled by keyboard navigation keys.
2. 3D Rotations on a cube with hidden surface elimination.(keyboard controlled)
3. Composite transformations
4. Bezier cubic splines like screen saver
5. Any Fractal Construction (Koch curve)
6. Animations using the above experiments.(eg.moving along curved path)

Any experiment according to the syllabus of CS010 702 Computer Graphics can be substituted subjected to permission from competent authority.
CS010 807  Project Work

Teaching scheme

6 hours practical per week

The progress in the project work is to be presented by the middle of eighth semester before the evaluation committee. By this time, the students will be in a position to publish a paper in international/ national journals/conferences. The EC can accept, accept with modification, and request a resubmission.

The progress of project work is found unsatisfactory by the EC during the middle of the eighth semester presentation, such students has to present again to the EC at the end of the semester and if it is also found unsatisfactory an extension of the project work can be given to the students.

Project report: To be prepared in proper format decided by the concerned department. The report shall record all aspects of the work, highlighting all the problems faced and the approach/method employed to solve such problems. Members of a project group shall prepare and submit separate reports. Report of each member shall give details of the work carried out by him/her, and only summarise other members’ work.

The student’s sessional marks for project will be out of 100, in which 60 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation committee.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.
CS010 808  Viva -Voce

Teaching scheme  credits: 2

A comprehensive oral Viva-voce examination will be conducted to assess the student's intellectual achievement, depth of understanding in the specified field of engineering and papers published / accepted for publication etc. At the time of viva-voce, certified bound reports of seminar and project work are to be presented for evaluation. The certified bound report(s) of educational tour/industrial training/ industrial visit shall also be brought during the final Viva-Voce.

An internal and external examiner is appointed by the University for the Conduct of viva voce University examination.

For Viva-voce, the minimum for a pass shall be 50% of the total marks assigned to the Viva-voce.

Note: If a candidate has passed all examinations of B.Tech. course (at the time of publication of results of eighth semester) except Viva-Voce in the eighth semester, a re-examination for the Viva-Voce should be conducted within one month after the publication of results. Each candidate should apply for this ‘Save a Semester examination’ within one week after the publication of eighth semester results.