

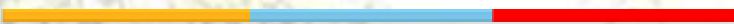


**Birla Institute of Technology & Science, Pilani**  
Hyderabad Campus

Dept. of Computer Sc. & Information Systems



**DEPARTMENT OF  
COMPUTER SCIENCE &  
INFORMATION SYSTEMS**



## **ABOUT THE DEPARTMENT**

The Department of Computer Science and Information Systems at BITS Hyderabad strives to produce engineers of tomorrow by imparting instructions with advanced curriculum, and research methodologies in modern areas of computer science and engineering. The department has vibrant student strength of about 600. The department has a good mix of faculty having experience in reputed academic institutes and industry. The department lays emphasis on the hands on through laboratories, computer oriented projects, research presentations to make the students industry ready. The department consistently attracts top BITSAT scorers every year.

### **Message from Head of the Department**

The Computer Science and Information Systems Department of our Campus offers doctoral, graduate and undergraduate programs in Computer Science. The core strength of the department is in the areas of Systems & Networks, Theoretical Computer Science, Computer Graphics, Databases, Software Engineering and Soft Computing. The faculty members of the department are engaged in high quality research, sponsored projects and industry engagement. The curriculum focuses on providing strong theoretical basics of Computer Science as well as hands on experience of their applications in industry. The department has collaborations with reputed MNCs and universities which gives valuable exposure to students. Almost all the students graduating from the department are placed in reputed companies such as Amazon, ebay, Microsoft, Morgan Stanley, Cisco, Qualcomm, EA Games etc. Many of the students are also going abroad to pursue higher studies in well reputed foreign universities.

# PROGRAMS OFFERED by the DEPARTMENT

- 1) B.E (Hons) Computer Science
- 3) M.E CS (Information Security)

## B.E. (Hons.) Computer Science

### Core Courses

- Computer Architecture
- Digital Design
- Design & Analysis of Algorithms
- Operating Systems
- Data Structures and Algorithms
- Theory of Computation
- Database Systems
- Programming Languages and Compiler Construction
- Computer Networks
- Discrete Structures for Computer Science
- Advanced Computer Architecture
- Digital Electronics and Computer Organization
- Micro Processors and Interfacing
- Object Oriented Programming

## M.E. Computer Science

- Network Security Advanced
- Algorithms Advanced
- Operating Systems Advanced
- Computer Networks Research
- Practice
- Advanced Computer Architecture
- Advanced Compilation Techniques

- 2) M.E Computer Science
- 4) Ph.D (Computer Sc. & Engineering)

## M.E Computer Sc. ( Information Security )

- Discrete Structures for Computer Science
- Number Theory
- Cryptography
- Combinatorial Mathematics
- Information Law and Cyber Law
- Computer Crime and Forensics
- Ethical Hacking
- Secure Software Engineering
- Network & Systems Security

### Elective Courses

- Computer Graphics
- Real-time Systems
- Object Oriented Programming and Design
- Reconfigurable computing
- Multimedia Computing
- Software for Embedded Systems
- Artificial Intelligence
- Data Mining
- Network Programming
- Data Storage Technologies and Networks
- Parallel Computing
- Number Theory
- Distribute Database Systems
- Cloud Computing
- Software Engineering
- Machine Learning

# Labs and facilities in CS&IS Department

The department has around 400 DELL/Lenovo machines as workstations and desktop PCs catering to the needs of Computer Science & Information Systems students for running their labs/programming assignments for the courses listed below. In addition to these, the department has IBM e-Server Blade Center running Windows 2003 Enterprise edition and Linux with servers like Redhat Enterprise Compute server, and FTP servers for use in the courses. The development tools and software available in these labs include TC Plus, Visual Studio 2008, Compilers (gcc /g++ & Sun's JDK), Script Interpreters (Tcl/Tk, Perl 5.0, and gawk), GNU Assemblers, flex, flex++, X-development tools, IBM Rational Rose, NetSim, IBM DB2, Oracle, Microsoft Virtual PC etc. The department has recently setup a virtual Infrastructure which comprises Academic vCloud Suite 5 (4 CPU license), vCenter Server for vSphere as softwares and 2 Servers with dual proc 6 cores (E2620)with Total 48 logical cores, 128 GB RAM, 6 GBPS HBA and Single Controller DAS with 8 TB

## Computer Networks & Network Programming lab:

In Computer networks laboratory, students diagnose various protocol message details like TCP/UDP using Wireshark. NetSim is used to simulate the features of IP routing, transport layer flow and congestion control, data link layer protocol modeling over CSMA/CD. In network programming, students develop programs to understand the client server model. Special emphasis is given on advanced topics like high request throughput (including ability to scale), multiplexing, buffering, stream/datagram based communication. Additionally, students develop network centric applications for Android devices and understand the limitations, when the computation and network bandwidth are constrained to preserve battery charge.



## Operating System Lab:

In Linux environment, students get hands on experience with the implementation of OS concepts. Coding assignments and laboratories include experiments on OS installation including partitioning and recovery, memory management, thread synchronization using semaphores, setting priority of processes, performance evaluation of different type of schedulers, kernel build and modifications to add custom system calls and device drivers, and debugging of applications.

## Database Lab

Using the latest software releases of Oracle, the students learn the design aspects of Relational databases. They execute projects on schema optimization, query performance improvements, writing structured queries to retrieve information spanning multiple tables and develop applications that use databases.

## Data Structure and Algorithms Lab

Students implement data structures like priority queues, hash table, BST, red-black trees etc using C over Linux experiencing the implementation challenges. Students develop solutions to standard problems like Knapsack, Hoffman code, N-queens, Travelling salesman problem using the well know techniques like divide and conquer, greedy, branch and bound, and backtracking. Students carry out the comparative performance analysis of several algorithms solving a given problem and thus they experience the significance of asymptotic notation in algorithms.

## Data Storage Lab

Using open source tools and shareware, students setup and work with SAN/NAS. They also look at the impact of network bandwidth on SAN performance. Multi-NIC machines are used in dedicated setup to allow for separate storage and IP-data traffic.



## Software Engineering lab

Students are exposed to live projects and take requirements from customers directly for implementing IT projects using well known software engineering principles like water-fall model, iterative model, and agile model etc. Students use tools like IBM Rational Rose to capture requirements, different views of systems architecture and design artifacts. They implement well known design patterns like observe-observable pattern, immediate pattern, and factory pattern etc.



## Intel Embedded systems lab

Intel has granted 15 Atom processor kits and embedded software for developing embedded systems. The lab is used by the students of Software for embedded systems. Also used for developing state of art projects in embedded systems.

## Distributed systems and Information security lab

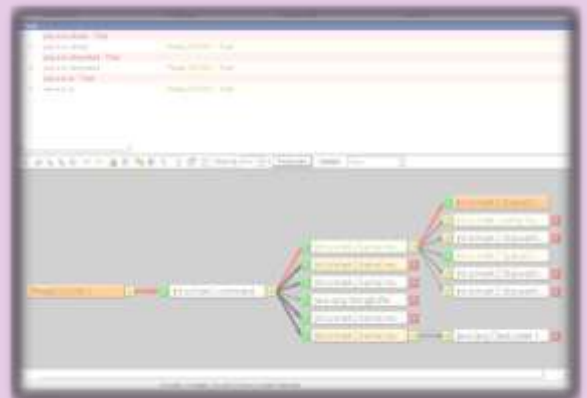
Students in this lab develop transparent programs for remote procedure calls over platforms like Sun RPC, and Java RMI. They create threads over Linux environment to build a distributed computing environment over multiple machines in the lab. Students implement logical clocks, and use these to guarantee distributed mutual exclusion. Students also implement their own distributed file systems and distributed schedulers using techniques like mounting, caching, sender initiated load distribution etc. In the information security lab, students write programs using Open-SSL API over Linux to build secure communication models in a client server environment. Students develop their own programs to analyze ciphers using symmetric key, asymmetric key, hash algorithms, and digital signatures. In this lab, students also use tools like nmap, and NESSUS to figure out presence of vulnerabilities in various machines in the lab.

## Compiler design lab

In this lab, students implement scanners, parsers, code generators, and optimizers using techniques like deterministic finite automata, push down automata, etc. Students are exposed to usage of tools like flex, bison, cgen etc available over Linux platform to implement the above phases of a compiler as an alternate option. Students under this lab also implement advanced topics like live variable analysis, peephole optimization etc.

## Computer organization and Advanced computer architecture lab

The Computer organization and architecture lab provides hands on experience on 8086 assembly programming using 'emu8086' emulator. Students design and implement combinational and sequential circuits such as adders, comparators, multiplexors, decoders as well as storage elements like the basic latch, flip-flops and registers etc. The logic design and implementation of these circuits is done using Hardware Description Language (HDL) in the Xilinx Integrated Software Environment. The Advanced architecture lab provides practical exposure to students using Intel VTune Performance Amplifier to find and fix performance problems in a compiled program written in the C/C++ language. Students analyze assembly files or disassembled compiler outputs. Students also use the VTune Performance Amplifier's dynamic assembly analyzer to dynamically analyze and fine-tune small sections of application and identify the exact instructions that cause critical performance problems. Students also get a hands-on exposure in parallelizing a sequential program like dense matrix and Graph algorithms to improve its performance using Intel Parallel Studio, and OpenMP/MPI.



## Research Areas in Computer Science

### Distributed Systems and Information Security

This research group addresses issues in supporting emerging network infrastructures, with particular focus on wireless mobile ad-hoc networks, sensor networks, peer-to-peer overlays, grid and cloud computing. Research is centered around the design and analysis of networking protocols and algorithms to support efficient and reliable communication. The groups research focuses on application of graph algorithms to improve the lookup efficiency in P2P overlays, assessing the impact of P2P traffic on IDS/IPS designs, energy-aware routing algorithms for wireless sensor networks, adaptive load distribution algorithms, distributed mutual exclusion over MANETs. The group also works in grid computing security and access control modeling, wherein the focus is about modeling authorization frameworks for single domain and multi-domain grid environments. Ranking based cross domain role mapping algorithms are used in multi-domain grid systems. Cloud computing research of this group proposes solutions for access control, trust based generic security framework, and cloud forensics. In cloud forensics, the researchers have proposed ideas for regenerating events using system snapshots for forensic analysis.

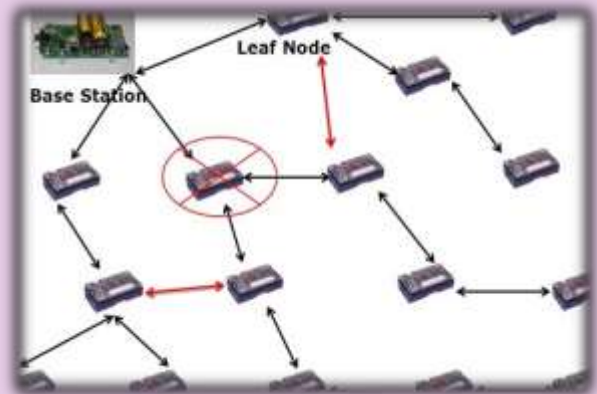


Faculty: Dr. Chittaranjan Hota, Dr. G Geethakumari, Abhishek Thakur, Digambar Povar, Rakhee, Gokul Kannan

### Data Management

In a sensor network, sensor nodes monitor and collect physical data without any human intervention for weeks or months. A node should consume less power for the above said operations for keeping the battery life longer. Sensor deployments must be energy efficient, and hence energy efficient data management strategies are necessary. This group is working on issues like efficient data storage, caching, and query techniques for sensory data. This group also works on data dissemination, and management in Information systems.

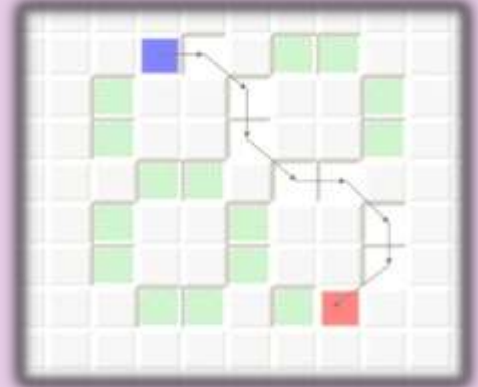
Faculty: Dr. Gururaj R



## Artificial Intelligence

This research group focuses on three main areas of research: Artificial Intelligence, and data mining. This group uses Data Mining and AI techniques to solve and create innovative and efficient solutions to complex problems like Smart playlist generation, Web Index Advertising Engine and Design and implementation of focused crawler for searching collaborators. In the playlist generation we attempt to suggest similar songs based on the seed songs selected by the user. Hybrid filtering techniques are used for finding similarity between the seed songs and the songs in the training set. In Web Index Advertising research, the group examines behavioral/contextual data of online consumers (who surf web pages) and also works on publishing more relevant advertisements efficiently improving user satisfaction over just in time, place and need parameters.

Faculty: Dr. Aruna M, Prafulla K, S.S Samant



## Software Engineering

This research group focuses on enhancing software quality and productivity by applying data mining algorithms to various software engineering tasks. As the IT industry is getting matured there is so much of data representing experience and knowledge of systems that is available with the providers and this group addresses several challenges posed during the mining of software engineering data. Secondly, the group also focuses on the implementation challenges of cloud computing in particular SaaS (Software as a Service) model. The main challenges in SaaS are design and development, revenue models, sales and compensation, customer service, support and maintenance and the group is working on generic products that take care of licensing and billing of all services offered by a SaaS provider.

Faculty: Dr. N.L.Bhanu Murthy, K.C.S. Murthy

## Computer Graphics

The primary area of research of this group is in computer graphics, computational geometry and its applications in solving different scientific and engineering problems. One of the focus areas of work is mesh generation which spans variety of problem domains starting from CAD Model meshing to fluid flow simulation. In particular Delaunay based methods for mesh generation are deeply studied, along with their scalability issues and the quality of results obtained in actual simulation process. such as mesh modification and optimization are also researched. Along with mesh generation, geometric reconstruction of boundary representation and their applicability for solving different scientific problem such as 3D surface reconstruction from different kind of volume data is also researched.

Dr. Tathagata Ray, C R Prasanna



## Student Activities

The Computer Science and Information Systems students are part of two associations (CSA) and (Extek) that are functioning from 2008. The activities of these associations are supervised by faculty members from the department.

The various activities conducted under these associations include technical competitions, programming contests, social activities etc. The department has a registered ACM student chapter in the region that facilitates students involvement in the Association of Computing Machinery

activities. The department also plays an active role in arranging and conducting lectures as part of BITS Embryo project, which is a BITSAA initiative.



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