



INSIDE THIS ISSUE

| | |
|------------------|---|
| Join the Mission | 1 |
| NPTEL Phase II | 2 |
| Spring Courses | 2 |
| Courses for You | 3 |
| Bookshelf | 4 |
| Profile | 4 |

CDEEP Shares Knowledge

Through 27 Live Webcast Courses
http://www.cdeep.iitb.ac.in/Live_webc/Mode.html

- Free Mode
- Solo Classroom

Through 14 Live EDUSAT Courses
http://www.cdeep.iitb.ac.in/Live_edu/model.html

- Live Classroom
- Extended Live Classroom
- Offline Classroom
- Credit Mode
 - IITB Certification
 - RC Certification

Through Recorded Courses on CDs/DVDs
http://www.cdeep.iitb.ac.in/rec_courses.html

- Choose from 86 Courses

Join the Mission to Spread Education through E-Learning

The Cabinet Committee on Economic Affairs has approved the proposal for a new scheme called the National Mission on Education through Information and Communication Technology (ICT), submitted by the Department of Higher Education, Ministry of Human Resource Development. This is a centrally sponsored scheme to leverage the potential of ICT in providing high-quality personalized and interactive knowledge modules over the internet/ intranet in the 'anytime, anywhere' mode for all learners in higher education institutions. This programme is expected to enhance the gross enrolment ratio in higher education in our country by five percentage points during the XI Five Year Plan period.

The Mission has two major components viz., (a) content generation and (b) connectivity along with provisions for access devices for institutions and learners. It seeks to bridge the digital divide, narrowing the gap between those urban and rural teachers/learners who can and cannot use computing devices for the purpose of teaching and learning in the domain of higher education. This scheme aims to empower those who have hitherto remained untouched by the digital revolution and therefore have not been able to join the mainstream of the knowledge economy. It plans to focus on appropriate pedagogy for e-learning, facilities to perform experiments through virtual laboratories, on-line testing and certification and on-line availability of teachers to guide and mentor learners. Teachers shall also be trained and empowered to effectively use this new method of teaching/learning. The Education Satellite (EDUSAT) and Direct to Home (DTH) platforms will also be utilized.

The Mission seeks to enhance the standards of education in government and private colleges. Renowned institutions will anchor various activities in their areas of excellence. The Mission will create high quality e-content for target groups and simultaneously seeks to extend computer infrastructure and

connectivity to over 18,000 colleges in the country including each of the departments of nearly 400 universities/deemed universities and institutions of national importance. The peer group-assisted content development shall utilise the wikipedia type of collaborative platform under the supervision of a content advisory committee responsible for vetting the content. Interactivity and problem solving will be addressed through the 'Talk to a Teacher' module. The Mission will also have a component on 'Teacher Empowerment' through which teachers are properly trained in digital literacy.

Enlistment of support and cooperation of states/union territories, institutions and individual experts is an integral part of the Mission. The National Programme on Technology Enhanced Learning (NPTEL) Phase II and III will be part of the content generation activity. An amount of Rs.4612 crore is to be incurred during the 11th Five Year Plan for this programme with a budget provision of Rs.502 crore during the current financial year, 2008-09.

This is an opportunity as well as a challenge for bright faculty members of universities and institutions of excellence to invest their intellectual capital so as to empower all learners in the country. The Mission envisages new ideas and concepts in e-learning. Faculty of universities, research institutions and colleges (public and private) are urged to contribute their ideas and suggestions in this area. Those who are motivated enough to take up a project that enhances the capabilities of e-learning, may send a two-page concept of the project clearly indicating the objective, methodology, financial and other support required along with the time-bound schedule of deliverables from the project. More information on activities under this Mission is available on the web site <http://www.sakshat.ac.in>.

N. K. Sinha, IAS
 Joint Secretary [DL/T]
 MHRD

SECOND PHASE OF NPTEL IS APPROVED

NPTEL is an acronym for the National Programme on Technology Enhanced Learning. As a part of this programme, seven IITs and IISc created a total of 240 courses to cover the core curriculum at the undergraduate level in the following engineering branches: civil, computer science, electrical, electronics and mechanical. About a half of these are video courses while the rest are web courses. These are now distributed through servers and CDs. They can also be received free of cost from YouTube, see www.nptel.iitm.ac.in. For more details, including information about their distribution, please see the article, 'NPTEL Courses and their Distribution' by Prof. Mangala Sunder at www.cdeep.iitb.ac.in/Reachout/Reachout-Sept.pdf. The NPTEL programme has been well received by the user community: it has been ranked fourth in the world, see www.oculture.com/2008/09/the_top_five_open_course_collections.html.

The second phase of NPTEL has just been approved. About 500 courses are expected to be created as a part of this phase. The salient features of this phase are given below.

Other disciplines: Courses will be created in other branches not covered in the first phase, i.e. aerospace, chemical, metallurgical engineering and also sciences.

Electives, PG courses: The first phase created only core courses at the undergraduate level. In the second phase, electives and postgraduate level courses will also be created.

More video courses: The student community seems to prefer video courses over web courses. In view of this, there will be more video courses in the second phase.

Faculty of other colleges: Courses of expert faculty members from reputed colleges and universities will also be included in the second phase.

Answering students' questions: A learning management system (LMS), such as Moodle, will be configured to promote discussions on the NPTEL courses. Through this LMS, answers to questions posed by students will also be answered by volunteers and full time employees.

The second phase of NPTEL is a part of the National Mission on Education through ICT (see the first page for an article on this topic by Shri N. K. Sinha). As a part of this Mission, we expect the development of several related activities, such as virtual labs and teacher training, that will complement and strengthen NPTEL.

Prof. Kannan M. Moudgalya
Head, CDEEP, IIT Bombay
Email: cdeep@iitb.ac.in

CDEEP COURSES-SPRING 2009

Given below is the list of courses being offered through CDEEP in the Spring (Jan-April) semester of 2009.

| No. | Course | Course Instructor | Discipline |
|-----|---|--|---|
| 1. | Finite Element Methods | Prof. Tarun Kant | Civil Engineering |
| 2. | Physical and Stochastic Hydrology | Prof. V. Jothiprakash | Civil Engineering |
| 3. | Instrumentation and Process Control | Prof. Kannan Moudgalya | Chemical Engineering |
| 4. | Thermodynamics of Polymeric Systems | Prof. Hemant Nanavati | Chemical Engineering |
| 5. | Computational Biology | Prof. Pramod Wangikar | Chemical Engineering |
| 6. | Advanced Process Control | Prof. R. Gudi | Chemical Engineering |
| 7. | Information Systems | Prof. D. B. Phatak | Computer Science & Engg. |
| 8. | Embedded Systems | Prof. Kavi Arya, Prof. K. Ramamritham & Prof. Kannan Moudgalya | Computer Science & Engg. |
| 9. | Introduction to Electronics | Prof. A. K. Verma | Electrical Engineering |
| 10. | Analog Circuits | Prof. Jayanta Mukherjee | Electrical Engineering |
| 11. | Signals and Systems | Prof. U. B. Desai | Electrical Engineering |
| 12. | Digital Systems | Prof. A. N. Chandorkar | Electrical Engineering |
| 13. | Control Systems | Prof. V. Kulkarni | Electrical Engineering |
| 14. | Digital Communication Systems | Prof. S. N. Merchant | Electrical Engineering |
| 15. | CMOS Analog VLSI Design | Prof. M. Baghini | Electrical Engineering |
| 16. | Digital Protection of Power Systems | Prof. S. A. Soman | Electrical Engineering |
| 17. | Systems Design | Prof. M. P. Desai | Electrical Engineering |
| 18. | Wavelets | Prof. V. M. Gadre | Electrical Engineering |
| 19. | Advanced Network Analysis | Prof. H. Narayanan | Electrical Engineering |
| 20. | Application of Power Electronics to Power Systems | Prof. B. G. Fernandes | Electrical Engineering |
| 21. | Computational Fluid Dynamics & Heat Transfer | Prof. Atul Sharma | Mechanical Engineering |
| 22. | Microfluidics | Prof. Amit Agrawal | Mechanical Engineering |
| 23. | Advanced Methods in Satellite Image Processing | Prof. B. K. Mohan | Centre of Studies in Resources Engg. |
| 24. | Introduction to Quantum Mechanics | Prof. Raghava Varma | Physics |
| 25. | Quantum Mechanics II | Prof. S. Umasankar | Physics |
| 26. | Molecular Biophysics | Prof. P. V. Balaji | School of Biosciences & Bioengineering |
| 27. | Optimization | Prof. P. S. V. Nataraj | Systems & Control Engg. |

COURSES FOR YOU

Computational Fluid Dynamics and Heat Transfer (ME 415)

Computational Fluid Dynamics and Heat Transfer (CFDHT) is a methodology for computer simulation of fluid mechanics and heat transfer problems. It is an open-ended application of undergraduate core courses of fluid mechanics and heat transfer. The increasing importance of engineering software development, application and analysis along with the lack of trained manpower in this area have greatly increased the significance of this course. CFDHT reduces the time and cost involved in designing and analyzing engineering processes and equipment and is slowly becoming an integral part of Computer Aided Engineering (CAE).

This course discusses in detail the procedure to develop/apply a general-purpose CFD code to various industrial problems. This consists of four steps: (i) Definition of the domain with initial and boundary conditions; (ii) Grid generation; (iii) Finite volume discretization over the specified grid and solution of resulting linear algebraic equations; and (iv) Analysis of the solution to obtain the desired information. This may be an engineering parameter extracted from the solution data set, an animation illustrating the transient evolution of the entire flow field, or anything in between.

While this course is introductory in nature for students with a basic knowledge of fluid mechanics, heat transfer and numerical methods, it also includes advanced topics such as computational multi-fluid dynamics. The objective of the course is to develop an appreciation of the theory behind the computer screen, so that CFD software can be developed/used intelligently. Furthermore, participants will learn to appreciate the nuances of the concepts through computer simulation of carefully designed exercise problems. With this two-pronged approach consisting of theory and exercise problems, every participant will be firmly set on the path to becoming a CFDHT expert.

CFDHT is taught as an interdisciplinary course to undergraduate and postgraduate students of various departments at IITB. It is taught using animated material that is designed using modern technology. Compared to simple graphics/figures, these colourful figures help the learner to quickly grasp and retain the subject matter.

Prof. Atul Sharma
Department of Mechanical Engg.
IIT Bombay
Email: atulsharma@iitb.ac.in



CMOS Analog VLSI Design (EE 618)

The rapid advance of the semiconductor industry, specifically CMOS technology, in the last few decades has led to an industrial revolution in electronics and communication industries. CMOS VLSI has provided an efficient platform for implementing a diverse range of functionalities in digital integrated circuits (ICs). However, all signals are not in digital form. For example, many sensors generate a continuous voltage which is inherently analog. Therefore, IC designers need to design front-end processing and conditioning circuits which acquire the analog signals from sensors, attenuate their noise, amplify them and finally convert them into digital form.

In *CMOS Analog VLSI Design*, we study, analyze and design different analog integrated circuits in CMOS technology for different applications. Analog circuits, in contrast to their digital counterparts, should satisfy many performance parameters and hence, design of such circuits is not formal. Analog circuits also have different architectures, which always makes their design an innovative task.

CMOS Analog VLSI Design is being offered through CDEEP this semester (Jan.-April '09). The following topics will be covered in this course.

In the first part of the course, large signal and small-signal modeling of transistors at different operating regions are taught. Design trade-offs are explained based on simple configurations. The objective is to teach students the kind of mathematics, modeling and approximations required for analog circuit design.

In the second part of the course, circuit structure, time-domain and frequency-domain performance, design tradeoffs and design techniques for different analog functional modules are explained. These modules mostly include single-stage and multi-stage amplifiers, differential amplifiers, operational amplifiers, reference generators, output stages and comparators.

This year, 0.13 μ m and 0.18 μ m CMOS technologies are used for all assignments and course projects. Students will use CAD tools in the VLSI lab of IIT Bombay to simulate the circuits they design.

Those who are in the final year or have already obtained a BE or B.Tech in Electronics or Electrical Engineering, are eligible to attend this course.

Prof. Maryam Shojaei Baghini
Department of Electrical Engg.
IIT Bombay
Email: mshojaei@ee.iitb.ac.in

USEFUL LINKS

| | |
|-------------------------------|---|
| IIT Bombay homepage | : http://www.iitb.ac.in |
| Web address of CDEEP | : http://www.cdeep.iitb.ac.in |
| Web address of NPTEL | : http://www.nptel.iitm.ac.in |
| All Courses of IIT Bombay | : http://www.cdeep.iitb.ac.in/courses |
| Live Webcast Courses | : http://www.cdeep.iitb.ac.in/solo |
| Live Edusat Courses | : http://www.cdeep.iitb.ac.in/Live_edu/index.html |
| CDEEP's Recorded Courses | : http://www.cdeep.iitb.ac.in/rec_courses.html |
| National Mission on Education | : http://www.sakshat.ac.in |

A Course in Calculus and Real Analysis

-Sudhir R. Ghorpade & Balmohan V. Limaye
432 pages, 71 figures
Springer, New York, 2006
ISBN 978-0387-30530-1



This book is a rigorous, well-written and self-contained introduction to calculus of functions of one variable. It develops the subject from a foundation of high school algebra and the presentation and sequencing of topics emphasize the structural development of calculus. The topics covered in this book are continuity, differentiation and integration of functions of one variable as well as sequences, infinite series and improper integrals. Due importance is given to computational techniques and applications.

The book contains many novel features which are rarely found in other books on calculus. The authors have striven to make a distinction between the intrinsic definition of a geometric notion and its analytic characterization. Throughout the book, the authors highlight the fact that calculus provides a firm foundation to several important concepts and results that are generally taken for granted in high school. The logarithmic, exponential and trigonometric functions are defined using the theory of Riemann integration and are shown to be transcendental. The cosine function is used to give a precise definition of an angle. A number of topics that may have been inadequately covered in calculus courses and glossed over in real analysis courses are treated here in considerable detail. As such, this book provides a unified exposition of calculus and real analysis. It also has a large collection of interesting exercises. Moreover, each chapter ends with an informative 'Notes and Comments' section.

This high-standard book can be used as a textbook for a serious undergraduate course in calculus. Parts of the book can be used for postgraduate or advanced undergraduate courses in real analysis. It is available in a paperback edition published by Springer (India), New Delhi. I would like to quote the following comment from a glowing review of this book by N. J. Wildberger, UNSW, Australia: "This book is a tour de force, and a necessary addition to the library of anyone involved in teaching calculus, or studying it seriously."

A sequel on calculus of functions of several variables is due to appear in the same Springer series.

Prof. Rekha P. Kulkarni
Department of Mathematics
IIT Bombay

Q & A

1. What is a 'course' offered through CDEEP?

A 'course' is a subject taught for one semester by an IIT Bombay instructor. This semester, CDEEP is offering 27 Live courses.

2. What is the duration of a semester?

IIT Bombay's academic year has the following semesters: Autumn (July-November) and Spring (Jan.-April).

3. How can I get CDEEP's recorded courses?

These recorded courses may be purchased only by institutions. To see the list of these courses, please visit http://www.cdeep.iitb.ac.in/ls/rec_courses.html

Prof. Krithi Ramamritham



After obtaining B.Tech (Electrical Engineering) and M.Tech (Computer Science) degrees from IIT Madras, Prof. Krithi Ramamritham went on to receive his Ph.D. in Computer Science from the University of Utah. After working at the University of Massachusetts from 1981-2001, he is currently at IIT Bombay as the Vijay and Sita Vashee Chair Professor in the Department of Computer Science and Engineering. He is also serving as the Dean (R&D) at IIT Bombay.

Prof. Ramamritham's interests span the areas of real-time systems, database systems, and real-time database systems. Concepts from these areas are used by him to solve problems in embedded systems, mobile computing, e-commerce, intelligent internet, and the Web. He is also interested in the use of information and communication technologies for creating tools aimed at socio-economic development.

Prof. Ramamritham has been associated with the editorial boards of various journals. These include Real-Time Systems Journal (Editor-in-Chief), IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Mobile Computing and the VLDB (Very Large Databases) Journal. Moreover, he is on the Board of Directors of Persistent Systems, Pune, on the Board of Trustees of the VLDB Endowment, and on the Technical Advisory Board of TTTech, Vienna, Austria, Microsoft Research India, and Tata Consultancy Services.

Of the two startups that he has co-founded, *Agrocom* offers award-winning information and communication technology-based real-time decision-support tools to farmers and organizations enabling progressive farming while *Nex Robotics* delivers high quality products in robotics and embedded systems.

Prof. Ramamritham is a Fellow of the IEEE, a Fellow of the ASM, and a Fellow of the Indian National Academy of Engineering. He is also a recipient of the Distinguished Alumnus Award from IIT Madras and the Doctor of Science (Honoris Causa) from the University of Sydney.

Email: krithi@iitb.ac.in

Phone: +91-22-2576 7740

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The Editor, **Reach Out**,

CDEEP Maths Building, IIT Bombay,

Powai, Mumbai 400076

Phone: 022-25764820 Fax: 022-25764812

Email: reachout@iitb.ac.in

Website: www.cdeep.iitb.ac.in/Reachout