PROFICIENCE

CONTINUING EDUCATION PROGRAMME

PROFESSIONAL INSTITUTIONS

INDIAN INSTITUTE OF SCIENCE

COURSE INFORMATION ON REGULAR COURSES & INTERNET BASED COURSES

AUGUST-DECEMBER 2006

CONTENTS

INTRODUCTION

Rapid strides in science and technology make it imperative that the education of professionals be continued over their entire career rather than be confined to a single stretch. What is needed is a complete integration of education with work during their productive life span, which will be adequate to help them cope with new demands. Continuing Education embraces all the processes of education that one undergoes throughout a working life and which have a relevance to the practical problems likely to be encountered in one's career. It may be realised through formal and informal modes of teaching, or through mass media. In recent years, there has been a growing awareness on the part of Universities that imparting knowledge to people beyond their boundaries is an equally important part of their service to the community. With this broad perspective of their function in society, Universities have begun to seek ways of reaching out to professionals. The Indian Institute of Science (IISc) has evolved several mechanisms to make the expertise and facilities available to qualified technical people in industries, Universities and research establishments. The need for forging links between academic institutions and industries and R&D organisations has been a goal set for the IISc by its illustrious founder, J.N. Tata.

PROFICIENCE was established with the objective of providing a sustained and rigorous continuing education program offering courses on subject of topical interest to scientists and engineers in and around Bangalore. This program, believed to be the first of its kind in the country, is a joint venture between IISc and several Professional Institutions/Societies in Bangalore. The program name signifies the coming together of Professional Institutions and the Indian Institute of Science. It was started on an experimental basis in 1980 and has proved to be extremely popular and has attracted wide attention in academic and professional circles. The demand for some courses, especially on computers, microprocessors and management is so overwhelming that it has not been possible to admit all the eligible applicants. Every year, there has been a steady increase in the number of students as well as the types of courses offered indicative of the growing popularity of this Program.

IISc is the custodian of the academic standards of all **PROFICIENCE** courses. It has the responsibility of evolving appropriate teaching norms, providing the venue and facilities for conducting courses, organising the tests and examinations and issuing certificates to the successful participants. These tasks are coordinated by the Centre for Continuing Education (CCE).

COURSES

The continuing education program organised under PROFICIENCE offers semester long courses in areas of topical interest. The courses are organised during evening hours so that working professionals can participate without getting their normal work affected. All courses are normally at the postgraduate level and many of these are in fact offered to the IISc students regularly. Participants in certain selected courses are provided practical training in computer and other laboratories, as appropriate. The course contents are regularly upgraded on the basis of feedback from the faculty and the participants. Courses are offered during the period **AUG-DEC** and **JAN-MAY** and around 15-20 courses are scheduled during each semester.

Each course has lectures at the rate of two or three hours per week depending upon the number of course credits. Tests and examinations are conducted according to the IISc norms. A series of courses leading to different specialisations are offered in a sequential manner, especially in the area of Computer Science and Engineering. This would enable the participants who start with the entry level courses progress towards more advanced ones and specialise in one of the streams.

EVALUATION

The total marks for assessment will be equally distributed between the sessional work and end semester examination. The sessional work consists of class tests, midsemester examination, homework assignments etc. as determined by the instructor. The participants who maintain a minimum of 75% attendance both in the theory and computer/laboratory classes will be evaluated based on the combined performance in the end semester examination and sessional work and assigned a letter grade.

NO RE-EXAMINATION SHALL BE CONDUCTED UNDER ANY CIRCUMSTANCES.

The letter grades carry a qualitative assessment as indicated below:

S-Outstanding; **A**-Excellent; **B**-Very Good; **C**-Good; **D**-Satisfactory; **F**-Fail.

CERTIFICATES

Certificates will be issued to only those who get at least a 'D' grade. Attendance certificates shall not be issued to any one. This being a continuing education program meant especially for self improvement, the credits accumulated cannot be equated with the credits earned through formal education. There shall be no claims for PROFICIENCE credits being counted towards partial fulfillment of credit requirements towards any degree/diploma or other formal recoginitions offered by IISc.

Formal Course completion certificates will not be issued under any circumstances to any candidate.

FACULTY

The instructors for the courses are mostly Institute Faculty. However, competent professionals from other R&D organisations and industries are also involved in teaching some of the courses.

FACILITIES

Computer Lab: A Computer Laboratory with 32 Intel-Pentium machines,4 Celeron machines, 2 Unix PC-Servers and a Silicon Graphics work station with a variety of latest software has been set up for the PROFICIENCE program. All these machines have been locally networked. A good collection of video cassettes pertaining to several courses is also available for viewing at the Centre for the participants. The Computer Laboratory is located at the Centre for Continuing Education (CCE) Building.

Library: PROFICIENCE participants can avail of the facility of IISc Main Library and they can also make use of the books in CCE. The books at both the IISc Main Library and CCE are meant only for **reference**. The participants can avail of this facility by producing their ID card issued by **PROFICIENCE**.

Timings: IISc Library - 8.00 a.m. - 9.00 p.m.
CCE Library - 2.00 p.m. - 8.00 p.m.

INSTRUCTIONS

ELIGIBILITY:

PROFICIENCE courses are open to those holding a graduate degree in engineering or postgraduate degree in relevant discipline. Specific qualification for the course and pre-requisites are listed along with the course description.

HOW TO APPLY:

Applications should be made in the prescribed forms which can be obtained from PROFICIENCE Office.

Candidates can apply for a maximum of **four** courses only. However, on selection, admission will be granted for a maximum of **two** courses, in the order of preference indicated in the check sheet.

Separate applications should be submitted for each course. For example, if one is applying for two courses, there must be two separate applications. The applicants should explicitly mention how they meet the pre-requisite in the respective column as this information will be used as the criterion for selection for the specific course.

Application forms must be accompanied by a copy of the relevant degree certificate and a passport size photograph. If the degree certificate of the University has not been issued, a ***Provisional Certificate*** from the University or from the Principal of the college, where the applicant has studied, has to be attached in the prescribed form (see Appendix 'A'). **(Course completion certificates and/or marks card will not be accepted in lieu of the degree certificate/provisional certificate)**.

SELECTION CRITERIA:

There is a maximum permissible and minimum required number of registrants for each course. If the number is less than the minimum required in a particular course, that course may not be offered. A course may also be dropped due to unforseen circumstances. The decision of the Chairman, CCE, shall be final in this regard.

Applicants may be required to take a written test for **selection to some of the courses**. The test will be of aptitude/objective type of **one hour duration**, confined to the minimum background and pre-requisites prescribed. The applicants called for the test will be intimated by post well in advance. The list of candidates called for the test will also be displayed on the **PROFICIENCE Office** notice board. The applicants are also requested to check with the Office for any information/clarification.

SELECTION INTIMATION:

The list of selected candidates will be displayed on the **PROFICIENCE Office** notice board. The candidates will also be intimated of their selection by post. **PROFICIENCE Office** is not responsible for any postal delay / loss.

ON INTIMATION OF SELECTION:

The selected candidates should produce the original certificates for verification and a passport size photograph (for identity card) along with the fees. Payment of fees should be made through an **"A/c payee" DD drawn on a nationalised Bank in Bangalore. The DD should be drawn in favour of COORDINATOR, PROFICIENCE. The fee will be received in the PROFICIENCE Office on the dates mentioned in the intimation letter** (please refer to the back cover).

FEES:

The course fee is Rs.1500/- per credit. Some of the courses include a limited exposure to computer operation and programming (C). The additional fees for this is Rs. 3,000/-. The course fee along with laboratory fee should be paid in full at the time of joining the course.

A concession of 10% in course fee will be allowed for **members** of the **participating professional bodies** and **students** and **employees of IISc**, who enrol in their individual capacity. (Members of the Professional Institutions and students and employees of IISc are required to furnish documentary proof of their current membership/studentship/ employee number.) Members of Professional bodies must produce the latest subscription paid receipts. No request for concession after the payment of fees will be entertained.

REFUND OF COURSE FEE:

Refund of course fee will not be made, unless, the course is withdrawn officially, in which case, the course fee paid is refunded in full. **Application fee once paid will NOT BE REFUNDED under any circumstances.**

APPLICANTS OF COURSES OFFICIALLY WITHDRAWN:

Applicants for those courses are given an opportunity to select other courses except courses which had an **aptitude test** provided they fulfill the requirements for the opted course. This can be done with the approval of the Chairman, CCE.

CLASSES:

Classes will be held in the Lecture Hall Complex of IISc. Lectures will be between 6.00 and 8.00 p.m. **Monday through Friday** and between 10 a.m. and 12 noon on **Saturdays**.

LABORATORY CLASSES: The timings and days for laboratory classes will be fixed in the second week of the respective months (August & January) after the complete registration is known. This will be done, keeping in view the convenience of the faculty and all the students of the courses with laboratory component.

RESULTS :

Results of the courses will be announced normally around 1st week of January for August-December term and 1st week of June for January-May term. Certificates will be issued on or after the date of announcement of results and against surrendering the Identity Card.

IDENTITY CARD:

Participants will be issued identity cards which should be shown on demand. The participants who have successfully completed should surrender the ID card at the time of receiving certificate, failing which the certificate(s) will not be issued to her/him. In the event of loss of identity card, the matter should be immediately reported to the PROFICIENCE office in writing. **A duplicate identity card will be issued on payment of Rs. 50/-.**

NO REQUEST FOR CHANGE OF EITHER THE STIPULATED DATES, MODE OF PAYMENT, CHANGE OF COURSE OR SUBMISSION/VERIFICATION OF ENCLOSURE TO APPLICATION ETC., WILL BE ENTERTAINED UNDER ANY CIRCUMSTANCES.

SCHEDULE FOR AUGUST-DECEMBER 2006

REGULAR COURSES

	Mondays 6.00 p.m. to 8.00 p.m.		
1.	Embedded System Programming Concepts	2+0	Dr. G N Rathna, EE & Mr. Mohamed Niaz, BEL
2.	Intellectual Property - Protection	2+0	Dr. S Rama Murthy, Intellevate
3.	Numerical Grid Generation & Fluid Flow Computations	2+0	Dr. P S Kulkarni, AE
	Mondays & Wednesdays, 6.00 p.m. to 7.30 p.m.		
4.	Plant Biotechnology & Molecular Biology	3+0	Prof. C Jayabaskaran, BC
	Tuesdays 6.00 p.m. to 8.00 p.m.		
5.	Advanced Finite Element Methods-II	2+0	Prof. P C Pandey, CE
6.	Cryptography & Network Security	2+0	Prof. R C Hansdah, CSA
7.	Wireless Mobile Communication	2+0	Prof. C Murali, MSRIT
	Tuesdays & Thursdays, 6.00 p.m. to 7.30 p.m.		
8.	CFD Algorithms for Compressible Flows	3+0	Dr. S V Raghurama Rao, AE
9.	Fiber-Optic Communications & Networks	3+0	Dr. T Srinivas, ECE
10.	Theory, Analysis & Design of Composite Materials & Structural Elements	3+0	Mr. G Narayana Naik, AE
	Wednesdays, 6.00 p.m. to 8.00 p.m.		
11.	Innovative Product Development & Triz	2+0	Prof. P Achutha Rao, NTTF & Mr. Kanwal Rai, Bangalore
12.	Vibration & Noise: Theory & Practice	2+0	Dr. S B Kandagal, AE
	Thursdays, 6.00 p.m. to 8.00 p.m.		
13.	Comprehensive Project Management	2+0	Mr. R Srivastava, ADA
	Fridays, 6.00 p.m. to 8.00 p.m.		
14.	Laboratory Animal Management	2+0	Dr. S G Ramachandra, CAF
15.	Structural Analysis & Design Optimization of Mechanical Systems	2+0	Dr. S B Kandagal, AE
	Saturdays, 10.00 a.m. to 12.00 Noon		
16.	Finite Element Method	2+C	Prof. P C Pandey, CE
17.	Intelligent Systems & Programming	2+0	Dr. H K Anasuya Devi, NIAS
	Saturdays, 2.00 p.m. to 5.00 p.m.		
18.	Strategic Management	3+0	Dr. Parameshwar P Iyer, CSIC

INTERNET BASED COURSES

	Saturdays		
19.	Internet Protocols, Design & Testing	3+0	Prof. P Venkataram, ECE
20.	Environmental Management	3+0	Dr. T V Ramachandra, CES
21.	Municipal Solid Waste Management	3+0	Dr. T V Ramachandra, CES

FEE STRUCTURE AT A GLANCE

REGULAR COURSES

Per Credit[#] : Rs.1,500/-

Computer Lab Fee: Rs.3,000/-

1. Course with 2 credits[#] ..... Rs. 3,000/-
2. Course with 2+C[$] credits .. Rs. 6,000/-
3. Course with 3[#] credits ..... Rs. 4,500/-

[#]credits = Lecture Hours per week

[$]C Stands for Computer Laboratory

INTERNET BASED COURSES

Per Credit: Rs.3,000/-

Courses with 3 credits ..... Rs. 9,000/-

REGULAR COURSES

AUGUST-DECEMBER 2006

1. EMBEDDED SYSTEM PROGRAMMING CONCEPTS (2+0)

Objectives

To teach the fundamentals of Embedded systems Design and programming.

Syllabus

Overview of Embedded Systems – Sequential and Concurrent Models – Processor Solutions and Types – Types of Memory – Data Representation Formats – Usage of C in Embedded Systems – Programmers view of CPU – IO programming models – Concurrent Software Design – Scheduling – Memory Management – Mixing C & Assembly – Real Time Embedded Systems – Hard and Soft Real Time Systems – Approaches for Real Time Scheduling - A Case Study.

Target Group

Fresher who wish to pursue a career in Embedded systems design and programming.

Faculty:

Dr. G N Rathna
Dept. of Electrical Engg., IISc.
E-mail: rathna@ee.iisc.ernet.in

Mr. Mohamed Niaz. M
Bharat Electronics, Bangalore
E-mail: mohamedniaz@gmail.com

Reference Books

1. *Frank Vahid and Tony Givargis*
   Embedded System Design: A Unified Hard ware/Software Introduction,
   John Wiley & Sons, 2002
2. *Daniel W. Lewis*
   Fundamentals of Embedded Software: Where C and Assembly Meet,
   Prentice Hall, 2002
3. *Jane Liu*
   Real-time Systems,
   Prentice Hall, 2000.

Minimum Background:
B.E/B.Tech in ECE / EE / IT
OR equivalent

Pre-requisites:

1. Basic Knowledge of C
2. Familiarity with microprocessors

Course Fee: Rs. 3,000/-

Schedule:

MONDAYS
6.00 p.m. to 8.00 p.m.

2. INTELLECTUAL PROPERTY - PROTECTION (2+0)

Objectives

To create awareness of Intellectual Property (IP) - Protection in the present industrial scenario and to impart basic knowledge of patent drafting.

Syllabus

Introduction and importance of Intellectual Property; Various forms of IP-Patents, copyright, Industrial Design and Trademarks; Pratical aspects of drafting patent documents; Application of IP knowledge for protection of innovative works and basic concepts about IP Management.

Target Group

National Laboratories, ISRO, Power Research Institutions, all R&D Institutions, Software Industries, Faculty of PG in Universities, Adocates practicing Intellectual property issues.

Faculty: **Dr. S RAMA MURTHY**
Patent Engineer
Intellevate (India) Pvt. Ltd., Bangalore
E-mail: murthy_132001@yahoo.com

Reference Books

1. *Prabudha Ganguli*
Intellectual Property, Vol I,
Pearson Education, 2003.

2. *P Narayan*
Intellectual Property Law,
Eastern Law House, Calcutta, 1990.

3. *Indian Patent Act & Patent Rules,*
Universal Law Publishing Co,
New Delhi, 2003.

Minimum Background:

B.E. / B.Tech or PG in Science/ Masters in Lib./ Humanities **OR** equivalent

Course Fee:

Rs. 3,000/-

Schedule:

MONDAYS
6.00 p.m. to 8.00 p.m.

3. NUMERICAL GRID GENERATION & FLUID FLOW COMPUTATIONS (2+0)

Objective

To impart knowledgbe in grid generation and computational fluid dynamics.

Syllabus

Instruction to geometrical aspect of simple and complex bodies, Mesh/grid generation methods, algebraic methods, PDE based methods, Goveng equations in fluid dynamics, levels of approximation, finite different methods, finite volume methods. Some exercises on flow computations.

Target Group

Aerospace Industries / National Laboratories.

Faculty: **Dr. P S Kulkarni**
Dept. of Aerospace Engg / JATP, IISc, Bangalore.
E-mail: psk@aero.iisc.ernet.in / pskdhar@hotmail.com

Reference Books

1. *Thompson J F, Warsi Zua & Wayne Martin C*
Numerical Grid Generation

2. *Weatherhill N P*
Grid Generation

3. *John D Anderson, Jr.*
Compuational Fluid Dynamics:
The basics with applications

Minimum Background:

B.E./MSc **OR** equivalent

Pre-requisites required:

Knowledge in Mathematics and Fluid Dynamics

Course Fee:

Rs. 3,000/-

Schedule:

MONDAYS

6.00 p.m. to 8.00 p.m.

4. PLANT BIOTECHNOLOGY AND MOLECULAR BIOLOGY (3+0)

Objective

To educate research students, post-graduate teachers and industrialists about recent development in plant biotechnology and biocompounds.

Syllabus

Overview of secondary metabolisms; structures, biosynthesis and functions of secondary metabolities; Metabolic engineering of secondary metabolic pathways; Plant transformation techniques - Agrobacterium - mediated plant transformation, direct gene transfer techniques and chloroplast transformation. Plant Molecular Farming. Genetically engineered plants; Plant tissue culture techniques, Micropropagation Gene cloning techniques; Plant cell signallings; Photosynthesis; Phytohormones, Methods for separation, purification and identification secondary metabolite

Target Group

Research Students, Post-doctoral Fellows, College Teachers & Biotechnology scientists

Faculty: **Prof. C JAYABASKARAN**
Dept. of Biochemistry, IISc, Bangalore.
E-mail: cjb@biochem.iisc.ernet.in

Reference Books

1. *A. Stater, N. Scott and Fowler*
Plant Biotechnology,
Oxford University Press, 2003.

2. *Introduction to Plant Biotechnology*
Oxford & IBH Publishing Co. Pvt. Ltd., 2002.

3. Metabolic Engineering of Plant Secondary Metabolism,
Kluwer Academic Press, 2000.

Minimum Background:
MSc (Life Sciences, Agri, Pharmacology), MVSc, MPharm, **OR** equivalent

Course Fee:
Rs. 4,500/-

Schedule:
MONDAYS & WEDNESDAYS
6.00 p.m. to 7.30 p.m.

5. ADVANCED FINITE ELEMENT METHODS -- II (2+0)

Objectives

This is a second level course covering some advanced topics in Finite Element Analysis. In particular, focus would be on Concepts and techniques of Nonlinear Finite element analysis in this course.

Nonlinear FEM techniques are usually not covered in the first course of FEM. The FEM treatment of Nonlinear problems requires additional background of the inelastic behaviour of materials and nonlinear-mechanics for better understading but, such options are generally not available to graduate engineers or even to post-graduates. However, practicing engineers, especially structural analysts and designers, usually come across many practical problems which require nonlinear finite element analysis. Most of the commercial packages do have nonlinear analysis facilites. However, even to use such packages a good understanding of Nonlinear Finite Element analysis techniques is required. The objective of this course is to introduce basic concept of nonlinear finite element analysis with reference to solid mechanics applications.

Syllabus

Review of linear FEM with reference to Isoparametric 2-D and 3-D finite elements. Concept of Material, Geometric and Contact nonlinearities. Elements of Nonlinear Mechanics, Constitutive relations using Plasticity. Finite-Deformation, Finite Element Formulation of nonlinear problems in Solid Mechanics. General Solution Techniques, Computational Aspects and application.

Faculty : **Prof. P. C. PANDEY,**
Dept. of Civil Engineering, IISc. E-mail: pcpandey@civil.iisc.ernet.in

Reference Books

1. *Cook, R. D., et.al,*
Concepts & Applications of Finite Element Analysis, John Wiley & Sons, 2002 (IV Ed).

2. *Zienkiewicz, O. C., and Taylor, R. L.,*
The Finite Element Method, V Edn., Vol 1 & 2, McGraw-Hill, 2002 (V Ed.).

3. *Reddy J N*
Nonlinear Finite Element Analysis

Minimum Background:
B. E./B.Tech (Civil/Mechanical/ Aerospace) OR equivalent

Pre-requisite required:
Basic knowledge of solid mechanics. An exposure to basic Finite Element Method.

Course Fee:
Rs. 3,000/-

Schedule:
TUESDAYS
6.00 p.m. to 8.00 p.m.

6. CRYPTOGRAPHY AND NETWORK SECURITY (2+0)

Objectives

This course is intended for all software engineers who need to deal with security issues in computer networks for either management or development purposes. Dealing with such issues needs a basic background in cryptography. Consequently, the course will start with exposure to basic techniques of cryptography. Subsequently, their applications for network security will be dealt with.

Syllabus

Requirements for Information and Network Security. Introduction to Number Theory. Symmetric and Public Key Cryptography. Conventional Encryption Techniques: DES, AES and BLOWFISH. Key Distribution. Public Key Cryptographic Techniques: RSA, Diffe-Hellman and DSS. Cryptanalysis. Message Authentication and Digital Signatures. Kerberos. E-mail and IP Security. Secure Socket Layer and Transport Layer Security. Secure Electronic Transaction. Network Management Security. Intruders and Viruses. Firewalls.

Target Group

Industries/R&D Units engaged in developing secure networking applications will benefit from this course. Besides, Industries/R&D Units which need to maintain networks will also benefit from this course.

Faculty: **Prof. R C HANSDAH**
Dept. of Computer Science & Automation, IISc.
E-mail: hansdah@csa.iisc.ernet.in

Reference Books

1. *William Stallings*
Cryptography & Network Security: Principles & Practice, III Edition, Pearson Education, 2002.

2. *C Kaufman, R Perlman & M Speciner*
Network Security: Private Communication in a Public World, Pearson Education, 2002.

3. *William Stallings*
Network Security Essentials: Applications & Standards, II Edition, Pearson Education, 2002.

Minimum Background:

BE/BTech in CS/IT/ECE/EE **OR**
MCA with Physics and Mathematics at the BSc level **OR**
MSc in Computer Science

Pre-requisites required:

1. Knowledge of data structures and Programming in C
2. Knowledge of Computer Networks at the undergraduate level.

Course Fee: Rs. 3,000/-

Schedule:
TUESDAYS
6.00 p.m. to 8.00 p.m.

7. WIRELESS MOBILE COMMUNICATION (2+0)

Objectives

To provide insight into mobile communication for engineering graduates and professionals.
To provide an overview of the concepts and principles.

Syllabus

Telephone networks, The Cellular concept - Frequency reuse, cellular systems, channel allocation, hand off strategies. Radio propagation - Models for path loss, reflection, diffrraction, scattering, shadowing, Multipath feeding, outdoor and indoor models, diversity techniques. Multiple access techniques - FDMA, TDMA, CDMA. IS-95 GSM Wireless data networking, WAP.

Target Group

Professionals in industry, R&D units, Teachers and Fresh Graduates in E&C/TC

Faculty: **Prof. C MURALI**
Dept. of E & C., MSRIT, Bangalore.
E-mail: muraliec@bgl.vsnl.net.in

Reference Books

1. Kamilo Feher,
   Wireless Digital Communications,
   PHI, 2004.
2. *D P Agrawal & Qing-Anzeng*
   Introduction to Wireless and Mobile Systems
   Thomson Books/Cole, 2003.
3. *Theodore S Rappaport,*
   Wireless Communications, II Ed (2002)
   Pearson Education.

Minimum Background:

B. E. (Electrical Sciences), MSc (Electronics), AMIETE in Electronics **OR** equivalent.

Pre-requisites:

Knowledge of Random processes, Modulation & coding theory, Radio propagation, antenna theory

Course Fee:

Rs. 3,000/-

Schedule:

TUESDAYS
6.00 p.m. to 8.00 p.m.

8. CFD ALGORITHMS FOR COMPRESSIBLE FLOWS (3+0)

Objectives

To introduce the basics of Computational Fluid Dynamics (CFD) and the algorithms for compressible fluid flows.

Syllabus

Navier-stokes equations and simplifications, alternative models based on Kinetic theory and Relaxation systems; Finite Difference and Finite Volume methods; Central Discretization methods; Upwind Methods; Flux Vector splitting, Riemann Solvers, Kinetic schemes and Relaxation schemes; Low diffusion schemes.

Faculty: **Dr. S V RAGHURAMA RAO**
Dept. of Aerospace Engineering, IISc
E-mail: raghu@aero.iisc.ernet.in

Reference Books

1. *Culbert B Laney*
   Computational Gas Dynamics
   Cambridge University Press, 1998.
2. *E F Toro*
   Riemann Solvers and Numerical Methods for Fluid Dynamics
   Springer Verlag, 1997.
3. *C Hirsch*
   Numerical Methods for Internal and External Flows (2 Volumes)
   John Wiley & Sons, 1988.

Minimum Background:
B. E./B.Tech/M.Sc. **OR** Equivalent

Credits:
3+0

Course Fee:
Rs. 4,500/-

Schedule:
TUESDAYS & THURSDAYS
6.00 p.m. to 7.30 p.m.

9. FIBER-OPTIC COMMUNICATIONS & NETWORKS (3+0)

Objective

The objective of the course is to introduce working engineers/scientists/Academicians to Fiber-optic communications & Networks. The course covers fundamentals as well as recent advances. Descriptive as well as Analytic approach will be followed. Numerical examples and software tools like OWNS will be used.

Syllabus

1. Introduction to Fiber-optic Communications
2. Components 1: Fibers, sources, detectors
3. System design - loss limited systems, dispersion limited systems
4. Generations of optical networks - SONET/SOH, WDM and all optical networks
5. Components 2: Components for WDM systems: Multiplexers/Demultiplexers, wave-length convertors, Add/drop, etc.
6. WDM network architectures and design
7. Optical Network management and control
8. Photonic switching
9. All optical networks
10. Topics from current literature

Faculty: **Dr. T SRINIVAS**
Dept. of Electrical Communication Engineering, IISc
E-mail: srinu@ece.iisc.ernet.in

Reference Books

1. *Rajiv Ramaswamy & Kumar N Sivarajan*
Optical Networks,
Morgan Kaufmann Publishers, 2002.

2. *A. Selvarajan, S. Kar & T Srinivas*
Fiber Optic Communications,
McGraw-Hill, 2002.

3. *G. Keiser*
Optical Fiber Communications
McGraw-Hill, 1998.

4. *Special issues of Latest IEEE Journals*

Minimum Background:
B.E. / B.Tech (Telecom, Computer Science, Electronics)
OR equivalent

Course Fee:
Rs. 4,500/-

Schedule:
TUESDAYS & THURSDAYS
6.00 p.m. to 7.30 p.m.

10. THEORY, ANALYSIS & DESIGN OF COMPOSITE MATERIALS AND STRUCTURAL ELEMENTS (3+0)

Objectives

The subject of composite materials is truly an interdisciplinary area where Chemists, Material Scientists, Chemical Engineers, Mechanical Engineers and Structural Engineers contribute to the overall product. The main objective of the course is to teach about the different aspects of Material Science, Mechanics and Design of Composite Materials & Structural elements. The course helps to know about the advanced materials, properties, functions and its applications. In addition, students can learn to analyse and design the composite structural elements.

Syllabus

Basic Concepts and Terminology, different types of fibers and matrices; ***Fibers****: Glass, Carbon, Boron, Organic, Ceramic, Metallic*; ***Matrices****: Polymers, Metals, Ceramics, Carbon, Cement.* ***Micromechanics of Composites****:* Prediction of elastic constants and strengths, mechanics of load transfer from matrix to fiber. ***Macromechanics of Composites****:* The theory of elasticity of isotropic and anisotropic bodies, Constitutive equations of a lamina, transformation of stresses, strains and material properties. Failure theories (criteria) for composite lamina. ABD matrices, Stress-strain analysis of lamina and laminates. Bending of plane anisotropic beams. Classical and first order theories of laminated composite plates. Analysis of Sandwich Plates. Buckling analysis of laminate composite plates. Design of composite laminae, laminates.

Target Group

Research & Development Organizations, Lecturers & Students of Engineering Institutions, Faculty of Diploma Colleges & Institutions, R&D Industries & Manufacturing Industries and Fresh Graduates & Post Graduates, Researchers, etc.

Faculty: **Mr. G NARAYANA NAIK**
Dept. of Aerospace Engineering, IISc
E-mail: gnn@aero.iisc.ernet.in

Reference Books

1. *Robert M Jones*
   Mechanics of Composite Materials, 2nd Ed, McGraw-Hill Kogakusha Ltd., 1999.
2. *John C Halpin*
   Primer on Composite Materials Analysis, Technomic Publishing Co. Inc., 1992.
3. *Krishan K Chawla*
   Composite Materials, Springer-Verlag, 1987

Minimum Background:
BE/BTech/AMIE/MSc
OR equivalent

Course Fee:
Rs. 4,500/-

Schedule:
TUESDAYS & THURSDAYS
6.00 p.m. to 7.30 p.m.

11. INNOVATIVE PRODUCT DEVELOPMENT & TRIZ (2+0)

Objectives

With globalisation, survival depends on the ability of the organisation to reduce the product development cycle time and offer innovative products to meet ever changing needs of the users. If innovation is to be a part of the product development process, the team members must be familiar with methods which will enhance direted creativity. TRIZ (Theory of Invention Problem Solving) offers the most powerful tools to resolve conflicts in design and to use resources, to minimise harmful effects and to move towards ideal final result. TRIZ, based on the knowledge of a vast number of patents, can help predict various trends which can be used to develop strategies to meet the challenges of change.

Syllabus

- Business, New product Development and Product Design - Organisation and Strategies
- Design Process - Creativity & Innovations
- Overview of TRIZ & Ideal Final result
- Design Conflicts & Resolution Strategies
- Trend Sighting & Directed Product Evolution
- Functional Modeling (Su-Fi Analysis)
- Inventive Standards for Product Design
- Failure Analysis
- Role of IPR in new product development

Target Group

Working engineers involved in R&D, Design, IPR Management. Teaching faculty connected with New Product Development Design RU&D.

Faculty:

Prof. P ACHUTHA RAO
NTTF School of Postgraduate Studies, Bangalore

Mr. KANWAL RAI
Director, IVAPS (P) Ltd., Bangalore

Reference Books

1. *Terninko, Zusmann & Zlolin*
   Systematic Innovation - An Introduction to TRIZ
2. *Darrel Mann*
   Hands on Systematic Innovations
   ISBN 90-77071-02-04

Minimum Background:

B.E. **OR** equivalent

Course Fee:

Rs. 3,000/-

Schedule:

WEDNESDAYS
6.00 p.m. to 8.00 p.m.

12. VIBRATION AND NOISE: THEORY & PRACTICE (2+0)

Objectives

Growing awareness of vibration, noise and harshness feeling has necessitated the valid design criterion in the design of machines, automobiles, buildings, industrial facilities, etc, and the increasing number of standard regulations and human comfort associated with noise, harshness and vibration makes it mandatory to control vibration and noise leading to quieter technology. This course aims at teaching the analytical and experimental skills to tackle the problems related noise, vibration and harshness (NVH) during design and manufacturing stage for technically superior and commercially viable product.

Syllabus

Vibration of structural systems. SDOF, MDOF and continuous systems.
Vibration and noise control elements: isolation, damping, balancing, resonators, absorption, barriers and enclosures. Vibration and noise standards. NVH measurement tools and techniques. Modal parameter (natural frequency, mode shape and damping) estimation techniques.. Signal and system analysis.
Noise and its effects on man. Acoustic and sound field. Enclosures, shields and barriers-design. Silencer and suppression systems. Noise level interpolation and mapping. Harshness effects and measurements and solutions. Case studies (engine noise and vibration, engine mounts, gear shift harshness, acoustic treatments, etc.,)

Target Group

Lecturers, R&D Labs in Automobile industry & Aerospace industry

Faculty : **Dr. S B KANDAGAL**
Dept. of Aerospace Engineering, IISc
E-mail: sbk@aero.iisc.ernet.in

Reference Books

1. *Harris, C W*
   Shock and Vibration Handbook,
   McGraw-Hill, New York, 1996.

2. *Ewins, D J*
   Modal Analysis: Theory & Practice
   Research Studies Press Ltd., England, 1984.

3. *Beranek, L L*
   Noise and Vibration Control,
   Wiley, 1988.

Minimum Background:

B. E./AMIE **OR** equivalent

Course Fee:

Rs. 3,000/-

Schedule:

WEDNESDAYS

6.00 p.m. to 8.00 p.m.

13. COMPREHENSIVE PROJECT MANAGEMENT (2+0)

Objectives

To enhance the Project Management capabilities of the participants to enable them manage their projects more efficiently and effectively.

Syllabus

Projects, need for their professional management, Project Management (PM), Systems' Approach to PM, Systems' Development cycle, Management functions pertinent to PM, Essential elements of PM, Network development and analysis, Project planning and control using PERT and CPM, Risk Management, Software PM, latest developments, quality standards and practices in PM.

Target Group

Working Project management professionals from various fields/areas with minimum 2 years of work-experience.

Faculty : **Mr. R SRIVASTAVA,**
Programme Management, Aeronautical Development Agency, Bangalore
E-mail: rajeev_srivastavain@yahoo.co.in

Reference Books

1. *Harold Kerzner*
Project Management-A Systems Approach to Planning, Scheduling & Controlling,
CBS Publishers & Distributors, 1998.

2. *Jerome D Weist & Ferdinand K Levy*
A Management Guide to PERT/CPM,
Prentic-Hall of India Pvt. Ltd., 1998.

3. *Bennet P Lientz & Kathryn P Rea*
Project Management for the 21st Century,
Academic Press, 1995.

Minimum Background:
B.E. / B.Tech/MSc.
OR equivalent

Course Fee :
Rs. 3,000/-

Schedule :
THURSDAYS
6.00 p.m. to 8.00 p.m.

14. LABORATORY ANIMAL MANAGEMENT (2+0)

Objectives

The use of animals in research and teaching imposes moral, scientific and legal obligations for humane care and treatment. This course provides essential information for the investigators/animal house managers about the standard practices to be followed in scientific management of the animal house, production of quality animals, current regulations and laboratory animal care.

Syllabus

Syllabus includes introduction, uses of animals in biomedical research, selection of animals and models, animal acquisition, housing, animal husbandry and veterinary care, occupational health and safety, animal use protocol, personnel and facility management, quality control and CPCSEA guidelines.

Faculty : **Dr. S G RAMACHANDRA,**
Central Animal Facility, IISc
E-mail: sgr@cidr.caf.iisc.ernet.in

Reference Books

1. *The UFAW handbook on 'The Care and Management of Laboratory Animals'*, Trevorpoole (Ed), Blackwell Publishing Ltd., 1999.
2. *Handbook of Laboratory Animal Science* Vol. I and Vol II, CRC Press, 2002.
3. *Reuter J D & Suckow MA (Eds)* Laboratory Animal Medicine & Management, IVIS, 2003

Minimum Background:
BPharma / BVSc. / MPharma / MSc **OR** equivalent

Course Fee :
Rs. 3,000/-

Schedule :
FRIDAYS
6.00 p.m. to 8.00 p.m.

15. STRUCTURAL ANALYSIS & DESIGN OPTIMIZATION OF MECHANICAL SYSTEMS (2+0)

Objectives

Advanced research in material science to enhance the life with reduced cost resulted in metal alloys, plastics, composites. Structural design and optimization of components with unusual shapes became possible with current available finite element software such as ANSYS, NISA, NASTRON, ABACUS etc. The fundamental knowledge of stress, strain, shear, torsion in relation to the structures and S-N curves in relation to the material becomes important. The interpretation of the FEM software output calls for the knowledge of analysis and design optimization of mechanical systems. This course essentially trains an engineer in the industry to optimally design various mechanical systems and sub-systems for technically superior and commercially viable value added product.

Syllabus

Strength of materials, concept of stress, strain and fatigue. Constitutive laws. Engineering materials and their properties. Structural analysis concepts, tension, compression, shear, torsion and S-N curves. Stability of elements of structures.

Principles of optimization, formulation of objective function and design constraints, classification of optimization problem. Single and multivariable optimization. Optimization with equality and inequality constraints.

Optimal design of mechanical elements – fasteners, springs, gears, bearings, belts, clutches, brakes, shafts and axles. Procedures for product design, development and testing. Case studies in optimal structural design of industrial products (car door window regulator, tracking antenna, hydraulic crawler driller, thermally insulated box, etc).

Target Group

Lecturers, R&D Labs in Automobile industry & Aerospace industry

Faculty: **Dr. S B KANDAGAL**
Dept. of Aerospace Engineering, IISc
E-mail: sbk@aero.iisc.ernet.in

Reference Books

1. *Shigley, J E & Mischke, C R*
Mechanical Engineering Design
Tata-McGraw-Hill, VI Ed, 2003.
2. *Mahadevan, K & Balaveera Reddy*
Design data hand book - for Mechanial Engrs.
CBS Publishers, III Ed, 1999.
3. *Johnson Ray, C*
Optimum Design of Mechanical Elements
John Wiley & Sons, 1990.

Minimum Background:

B. E./AMIE **OR** equivalent

Course Fee:

Rs. 3,000/-

Schedule:

FRIDAYS
6.00 p.m. to 8.00 p.m.

16. FINITE ELEMENT METHOD (2+C)

Objectives

This is a foundation course in Finite Element Method (FEM) aimed at Civil, Mechanical and Aerospace Engineering professionals. In particular, it would be beneficial to engineers who do not have any formal training in FEM, even though, they may have skill to use a FEM package. The course is designed to provide a basic introduction to FEM with emphasis on stress and structural analysis. It is believed that it would be of interest to engineers working in industries, consulting firms, and teachers of engineering colleges.

Syllabus

Concept of Stiffness and Flexibility in structural analysis. Basic foundations of elasticity and energy principles, Introduction to displacement based FEM with reference to continuum and skeletal structures. Element formulation and Applications to Plane stress, Plane strain, Axisymmetric, plate bending and 3-D problems. Isoparametric concept, Equation solvers, Post-processing, Adaptivity, Programming and Computational aspects, practical applications. Hands-on practice using available FEM package.

Faculty : **Prof. P. C. PANDEY,**
Dept. of Civil Engineering, IISc
E-mail: pcpandey@civil.iisc.ernet.in

Reference Books

1. *Cook, R. D., et.al,*
Concept and Applications of Finite Element Analysis,
John Wiley & Sons, 2002 (IV Edn).

2. *Chandrupatala, T. R., and Belegundu A. D.,*
Introduction to Finite Elements in Engineering, Prentice Hall - Indian Edition - III Ed, Aug 2003.

3. *Zienkiewicz, O. C., and Taylor, R. L.,*
The Finite Element Method,
V Edn., (3 Vols),
Butterworth Heinemann, New Delhi, 2002.

Minimum Background:
B. E./B.Tech (Civil/Mechanical/ Aerospace) OR equivalent

Course Fee:

Rs. 6,000/-

Schedule:
Theory: SATURDAYS
10.00 a.m. to 12.00 noon

Lab: SATURDAYS

12.30 p.m. to 3.30 p.m.

17. INTELLIGENT SYSTEMS & PROGRAMMING (2+0)

Objectives

- To introduce the state of art of soft-computing methods, Human-Machine Interaction and the techniques involved in Artificial Intelligence to those who possess post-graduate drgree in Science/Arts/Management/Engineering.
- To enhance the background and technical skills of IT professionals to use AI technology in industry.
- Facilitates Teaching profession.

Syllabus

Overview of AI – Knowledge Structures – Knowledge Engineering – Knowledge Representation – Logic Programming – Problem Solving Strategies – Inference and Control - Reasoning Techniques – Forward and Backward Chaining - Laboratory Work and Assignments – Agent Based Algorithms and Computing - Knowledge Based Systems – Machine Learning – Expert Systems – Knowledge Acquisition - Natural Language Processing – Pattern Recognition - Artificial Neural Networks – Project Work.

Target Group

R&D Units

Faculty : **Dr. H K ANASUYA DEVI,**
National Institute of Advanced Studies, IISc Campus
E-mail: hka@nias.iisc.ernet.in

Reference Books

1. *Satish Kumar*
Neural Networks,
Tata McGraw-Hill, I Ed, 2004.
2. *George F Luger*
Artificial Intelligence: Structures & Strategies for Complex Problem Solving
Pearson Education (IV Ed), 2002.
3. *Elaine Richie & Kevin Knight*
Introduction to Artificial Intelligence,
Tata McGraw-Hill, II Ed, 1999.

Minimum Background:
BE/MCA/MTech/PG in Science/ PhD in Science **OR** equivalent

Pre-requisites:
Knowledge of Mathematics upto graduation with knowledge of programming.

Course Fee:
Rs.3,000/-

Schedule:
SATURDAYS
10.00 a.m. to 12.00 Noon

18. STRATEGIC MANAGEMENT (3+0)

Objectives

To teach basic concepts and practices in strategic management. To provide the participants the opportunity to make actual strategic decisions, realizing that the rationale for the decisions will be more important than the actual decisions themselves. Taught as a capstone course in MBA Curricula, this course will cover all aspects of mastering business policy and strategic management.

Syllabus

Concept of strategic management; Vision and mission; External environment; Internal assessment; Strategies in action; Strategic analysis and choice; Implementing strategies: management issues; Marketing, finance, R&D, and Information Technology issues in Strategy; Strategic Management Cases.

Faculty: **Dr. PARAMESHWAR P IYER**
Dept. of Management Studies, IISc
E-mail: iyer@csic.iisc.ernet.in

Reference Books

1. *Fred R. David*,
Strategic Management: Concepts and Cases
Prentice Hall, USA, 2001.

2. *R. Das*,
Crafting the Strategy
Tata McGraw Hill, 2000.

3. *G. Johnson and K. Scholes*,
Exploring Corporate Strategy: Text and Cases,
Prentice Hall India, 1996.

Minimum Background:

B.E. / B.Tech / MSc
OR equivalent

Course Fee:

Rs. 4,500/-

Schedule:

SATURDAYS
2.00 p.m. to 5.00 p.m.

INTERNET BASED COURSES

INTERNET BASED COURSES

Outline & Objective

Competency based education is defined as an instructional system in which a performance-based learning process is used. The learner demonstrates his/her level of attainment on subject-area. Intensive internet based course format, gives the participants to take more responsibility for their own learning process. Subject material for courses in Internet Based Education is offered in four different modes for the registered participants:

I. *Downloadable mode*: Downloadable mode empowers to offer education in a dynamic form to students. Participants can access lessons, assignments and submit their scripts online. They need not brood if they miss lessons - they can download the lesson notes and access archived lessons, tutorial sessions, lectures, etc.

II. *Read-only mode*: Participants may be able to only read the course materials on concepts and analysis

III. *Interaction-through-Internet*: The interactive learning provides an environment for participants to talk and discuss freely about any related topics on-line or off-line.

There are two ways of interaction

- Xchat: Client Server Model that works with Internet Relay Chat Server Protocol, it allows servers to connect to each other effectively forming a network. Protocol is used by servers to talk to each other. Instructor and participants can interact and discuss on related topic for stipulated time given by the Instructor.
- Mailing Group: Participants can become member of mailing group by registering their name in the group. Once approved by the instructor, participants can post their questions to this group ID. This way Course Instructor or any other participant can reply to questions that will be read by all the members in that group including the instructor.

IV. Classroom Interaction: The classroom session will be held in CCE Lecture halls. Duration will be notified by the instructor. During the classroom session, participants coming from outstation have to arrange their own accommodation.

19. INTERNET PROTOCOLS, DESIGN & TESTING (3+0)

Objective

This course gives the participants the theoretical and practical knowledge of internet and its applications in various fields. Courses like Web creation, Business application on E-Commerce, Multimedia, mail, etc. The curriculum is aimed at training the engineering graduates to enable them to the better opportunities in Information technology sector.

Syllabus

Part I - INTERNET ACCESS

1. **Overview of Internet**:
   History, Computer networking, Developments, Taxonomy of Internet and Applications.
2. **Internet Protocols**:
   TCP/IP protocol suite, Application Protocols: Email, SNMP, SMTP, ping, finger, FTP, Telnet, Other tolls like finger, nslookup, whois, ping, PETSIM.
3. **Network Connectivity**:
   Network Connectivity, WANs in India, WANs in world, Modern, hubs, bridges, routers, switches, PC to Internet connection protocols, PPP, SLIP.
4. **Protocol Testing**:
   Conformance Testing Methodology and Framework, Testing Architecture, Test Sequence Generator Method , Testing with TTCN,RIP,SDL Based tool, SDL based performance Testing of TCP, OSPF, Interoperability Testing, Testing of CSMA/CD protocol using bridge, Scalability testing of BGP.

Part II - ADVANCES INTERNET TECHNOLOGY

High Speed Networks, MPLS, VPN, Multimedia protocols, IPV6, wireless network architecture M-Commerce, Wireless network architecture, Mobile computing, Mobile-IP.

References

1. Pallapa Venkataram & Sunilkumar S Manvi, Communication Protocol Engineering
2. A. De and Venkataran. P Validation and Termination Detection of Communication Protocols by an Expert System, Proceedings IASTED International Symposium on Expert Systems: Theory and Application, pp. 1-4, 1990

Duration & Course Fee

The course is designed for 4 months (total credits 3+0). Course Fee is Rs.9,000/-. The intake is limited to 50 and the admission is based on First-cum-First-Served basis.

Minimum Background: Is open to any engineering graduate

Course Schedule

- ★ Classroom briefing and introductory sessions at the beginning of the course (3 days)
- ★ Interactive session through WEB and Email for two months
- ★ Mid-term contact session (3 consecutive days) & Mid-term Exam
- ★ Project work after the Mid-term contact session
- ★ Final contact session (3 days) and Final exam at the End of the Course

Faculty: **PROF. P VENKATARAM,** Dept. of ECE, IISc.
E-mail: pallapa@ece.iisc.ernet.in

20. ENVIRONMENTAL MANAGEMENT (3+0)

Objective

This course provides an overview of the key concepts and principles in environmental management, areas of global and national environmental concern, and strategies and tools for effective environmental management. Attempt to understand the genesis of environmental problems; the concerns that lead to various international and national initiatives to tackle them have been made in this course. Various tools, which can be used to address environmental problems and the role that the professionals can play in managing environment in their respective areas would be discussed.

Syllabus

1. Principles of Environmental Management.
2. Principles of Ecology, Environment & Environmental Management.
3. Policies and Legal Aspect of Environmental Management.
4. Overview of Environmental Impact Assessment (EIA).
5. Preparation and Review of Environmental Impact Assessment Report.
6. Environmental Audit.
7. Life Cycle Assessment as EM Tool.
8. Environmental Management Systems Standards: ISO 14000 (EMS).
9. Related Issues in Environmental Management.
10. Environmental Design.
11. Environmental Economics.
12. Basics of Data base Management System (DBMS), Geographic Information System (GIS) and Remote Sensing
13. Geographic Information System (GIS) and Remote Sensing in Environmental Management.

Minimum Background Required

Graduates in Engineering

Duration & Course Fee

The course is designed for 4 months (total credits 3+0).

Course Fee: Rs.9,000/-. The intake is limited to 50 and the admission is based on First-cum-First-Served basis.

Course Schedule

- Classroom briefing and introductory sessions at the beginning of the course (3 days - 26th Aug - 28th Aug 2006)
- Interactive session through WEB and Email for two months
- Mid-term contact session (3 consecutive days) & Mid-term Exam
- Project work after the Mid-term contact session
- Final contact session (3 days) and Final exam at the End of the Course

Faculty: **DR. T V RAMACHANDRA,** Centre for Ecological Sciences, IISc
E-mail: cestvr@ces.iisc.ernet.in

20. ENVIRONMENTAL MANAGEMENT (3+0)

Objective

This course provides an overview of the key concepts and principles in environmental management, areas of global and national environmental concern, and strategies and tools for effective environmental management. Attempt to understand the genesis of environmental problems; the concerns that lead to various international and national initiatives to tackle them have been made in this course. Various tools, which can be used to address environmental problems and the role that the professionals can play in managing environment in their respective areas would be discussed.

Syllabus

1. Principles of Environmental Management.
2. Principles of Ecology, Environment & Environmental Management.
3. Policies and Legal Aspect of Environmental Management.
4. Overview of Environmental Impact Assessment (EIA).
5. Preparation and Review of Environmental Impact Assessment Report.
6. Environmental Audit.
7. Life Cycle Assessment as EM Tool.
8. Environmental Management Systems Standards: ISO 14000 (EMS).
9. Related Issues in Environmental Management.
10. Environmental Design.
11. Environmental Economics.
12. Basics of Data base Management System (DBMS), Geographic Information System (GIS) and Remote Sensing
13. Geographic Information System (GIS) and Remote Sensing in Environmental Management.

Minimum Background Required

Graduates in Engineering

Duration & Course Fee

The course is designed for 4 months (total credits 3+0).

Course Fee: Rs.9,000/-. The intake is limited to 50 and the admission is based on First-cum-First-Served basis.

Course Schedule

- Classroom briefing and introductory sessions at the beginning of the course (3 days - 26th Aug - 28th Aug 2006)
- Interactive session through WEB and Email for two months
- Mid-term contact session (3 consecutive days) & Mid-term Exam
- Project work after the Mid-term contact session
- Final contact session (3 days) and Final exam at the End of the Course

Faculty: **DR. T V RAMACHANDRA,** Centre for Ecological Sciences, IISc
E-mail: cestvr@ces.iisc.ernet.in

21. MUNICIPAL SOLID WASTE MANAGEMENT (3+0)

Objective

The quantum of solid waste generation has considerably increased and the characteristics of wastes have also significantly changed over the years, with the unplanned growth of population, increased urbanization and developmental activities which are seriously degrading the urban and semi-urban environment in many parts of the world, placing enormous strain on natural resources and undermining efficient and sustainable development. Daily thousands of tonnes municipal solid waste is simply being dumped on open lands and these existing sites are overflowing with new wastes and identification of new sites for disposal of wastes are becoming scarce. Therefore, there is a need is to raise awareness on the use of appropriate technologies for efficient management of solid waste. Against this backdrop, the course will discuss the basic concepts of solid waste and their classifications based on sources and types followed by the aspects of environmentally sound management practices and the current scenario of solid waste in India.

Syllabus

1. Municipal Solid Waste Management: An Introduction.
2. MSWM In India: Issues and approaches
3. Generation and Characteristics of Waste.
4. Waste Collection, Storage and Transport.
5. Waste Disposal.
6. Waste Processing Techniques.
7. Source Reduction, Product Recovery and Recycling.
8. Recovery of Biological Conversion Products: Compost and Biogas.
9. Incineration and Energy Recovery.
10. Hazardous Waste: Management and Treatment.
11. Integrated Waste Management (IWM).
12. Basics of Data base Management System (DBMS), Geographic Information System (GIS) and Remote Sensing
13. Geographic Information System (GIS) and Remote Sensing data in planning and management of MSW.

Minimum Background Required

Graduates in Engineering

Duration & Course Fee

The course is designed for 4 months (total credits 3+0).

Course Fee: Rs.9,000/-. The intake is limited to 50 and the admission is based on First-cum-First-Served basis.

Course Schedule

- Classroom briefing and introductory sessions at the beginning of the course (3 days - 26th Aug - 28th Aug 2006)
- Interactive session through WEB and Email for two months
- Mid-term contact session (3 consecutive days) & Mid-term Exam
- Project work after the Mid-term contact session
- Final contact session (3 days) and Final exam at the End of the Course

Faculty: **DR. T V RAMACHANDRA,** Centre for Ecological Sciences, IISc
E-mail: cestvr@ces.iisc.ernet.in

Appendix `A' **PROFORMA**

NAME OF THE COLLEGE

PROVISIONAL CERTIFICATE

This is to certify that Sri/Smt.....

was a student of this college studying in.....*

Course.....**

branch during the session.....to.....

He / She has successfully completed the course as prescribed by the.....University with regard to course of study, attendance, sessional requirements etc.

He/She has passed the final.....* examination held during.....securing.....class as per the results announced by the University. He/She will be awarded the.....degree during the next convocation of the University.

College Seal PRINCIPAL

Date :

**Appropriate course to be filled in (B.E., M.E., M.Sc., M.Com., M.B.B.S., etc)*

*** Mention Civil, Electrical, Electronics, Chemistry, Biology, etc.,*

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