

QUALITY IMPROVEMENT PROGRAMME

Sponsored by
ALL INDIA COUNCIL FOR TECHNICAL EDUCATION
(A Statutory Body of the Government of India)

STATUS REPORT
2005-2006



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

PREFACE

The report summarises the activities of the overall Curriculum Development Cell and the Quality Improvement Programme at IIT Guwahati during the year 2005-2006.

During the year six nos. of teachers have joined the M. Tech. programme and respectively seven and three nos. of teachers have joined for the advance and final admissions in Ph. D. Programme of the institute.

Twelve nos. of QIP short-term courses were conducted during the year on different topics.

The overall guidance of the Director and Dy. Director in the CDC activities is highly appreciated. The valuable support of the members of the Advisory Committee is also greatly acknowledged. Thanks are also due to staff of the QIP and the administrative and accounts staff of the Institute, without their active cooperation, the activities of the QIP/CDC would not have been successfully carried out. The support of AICTE is also gratefully acknowledged.

(Dr. R. Tiwari)

Coordinator, QIP

Quality Improvement Programme

Objectives & Programmes

Quality Improvement Programme (QIP) of the Ministry of Human Resource Development, Department of Education, Government of India, under the sponsorship of All India Council for Technical Education, New Delhi has been in operation at the IIT Guwahati since 2003-2004.

Quality Improvement Programme is being implemented with the objective of upgrading the expertise, qualification and capabilities of the faculty members of degree level technical institutions. The major activities under the QIP include :

- **Masters and Doctoral Programme** :Under this scheme, faculty member of AICTE approved institutions are given opportunity to upgrade their qualifications. Certain selected institutions offer Masters and Ph.D Programmes to the faculty members and they are paid scholarships and contingency grant by the Council. Recently, the facility of pursuing Masters Degree programmes has been extended to approved polytechnic teachers also.
- **Short Term Programme** :In order to upgrade the knowledge and skills of the teachers working in the different institutions in the country, AICTE provides Financial Assistance for organizing short term training programmes in the emerging areas of Engineering Technology / Pharmacy / Management etc.
- **Curriculum Development** :The major QIP Centres are provided assistance to organize workshops for Curriculum Development. This leads to Model Curriculum, which is used as a base documents by many institutions.

Programme 1 : QIP Ph. D.

During the year 2005-2006, 7 students selected for advance Ph. D. programme and three students selected for final admission. The details are as follows :

Advance admission to Ph. D. programme 2005-2006

Sl. No.	Name	Department	Name of the Parent Institute	Date of joining
1.	Mr. M Venkata Satish Kumar	Biotechnology	Vignan's Engg. College, Vadlamudi, Guntur	-
2.	Mr. Abdul Munim Choudhury	CE	N. I. T. Silchar	-
3.	Mrs. Kabita Chakrabarty	Chem. Engg.	Assam Engg. College, Jalukbari, Guwahati	-
4.	Mr. Rupam Baruah	CSE	Jorhat Engg. College, Jorhat	-
5.	Mrs. Amrita Ganguly	ECE	Assam Engg. College, Jalukbari, Guwahati	-
6.	Mr. Pobon Kumar Sarmah	ECE	Jorhat Engg. College, Jorhat	-
7.	Mr. Baharul Islam Barbhuyan	ME	Assam Engg. College, Jalukbari, Guwahati	-

Final admission to Ph. D. programme 2005-2006:

Sl. No.	Name of the QIP Scholar	Dept.	Name of the Parent Institute	Date of joining
1.	Mr. Laskar Aminul Islam	CE	National Institute of Technology, Silchar-788010, Assam	
2.	Mrs. Bandana Chakraborty	Chem. Engg.	Assam Engineering College, Jalukbari, Guwahati-13	
3.	Mr. Arup Bhattacharjee	CSE	National Institute of Technology, Silchar- 788010, Assam	

Summary Information of the Number of Teachers Admitted to Ph. D. Programme
under QIP at Indian Institute of Technology, Guwahati
State-wise

State	year	Ph. D.
Assam	2005-06	6
Andhra Pradesh		1

Programme 2 : QIP M. Tech. programme

During the year 2005-2006, 6 students have joined this course. The details of them are as follows :

Admission to M. Tech. Programme 2005-2006

Sl. No.	Name	Department	Name of the Parent Institute	Date of joining
1	Mrs. Ujwala Baruah	CSE	N. I. T., Silchar	July 2005
2.	Mr. Rubul Hussain Laskar	ECE	N. I. T., Silchar	July 2005
3.	Miss. Mitali Saikia	ECE	Jorhat Engg. College, Jorhat	July 2005
4.	Mr. Baburaj P.	ECE	Govt. College of Engg. Kannur	July 2005
5.	Mr. Ajoy Krishna Dutta	ME	Jorhat Engg. College, Jorhat	July 2005
6.	Mr. Prafulla Kumar Swain	ME	Majhighariani Instt. of Technology, Rayagada	July 2005

Summary Information of the Number of Teachers Admitted to M. Tech.
Programmes under QIP at Indian Institute of Technology, Guwahati
State-wise

State	Year	M. Tech.
Assam	2005-06	4
Kerala		1
Orissa		1
Total		6

Summary Information of the Number of Teachers Admitted to M. Tech. and Ph.
D. Programmes under QIP at Indian Institute of Technology, Guwahati -
Department-wise

Department	Department	No. of Teachers admitted	
		M. Tech.	Ph. D.
Computer Sc. & Engg. (CSE)	2005-06	1	1
Civil Engg. (CE)		-	1
Electronics & Communication Engg. (ECE)		3	2
Mechanical Engg. (ME)		2	1
Chemical Engg. (CH)		-	1
Biotechnology (BT)		-	1
Total		6	7

Information on Short Term Courses 2005 - 2006 under QIP:

Sl. No.	Course Coordinator & Dept.	Duration	Title of STC Outline and Objectives
1	Dr. V. S. Moholkar Dept. of Chemical Engg.	May 9 - 14, 2005	<p>Advanced Reactor Simulation</p> <p>Topic</p> <ul style="list-style-type: none"> - Two-Dimensional Modeling of Chemical Reactors - Numerical Solution of One-Dimensional Models - Catalytic Reactor Simulation - Fluidized Bed Reactors - Reactor System Optimization - Computational Fluid Dynamics for Chemical Reactor Design - Control of Reactors -
2	Dr. Ratnajit Bhattacharjee Dr. Abhijit Mitra, Dept. of ECE	May 23 -28, 2005	<p>Signal processing applications in communication engineering</p> <p>The explosive growth in the field of modern communication systems has been possible to a great extent based on sophisticated techniques for analyzing as well as processing communication signals in digital form. The development of various signal processing algorithms and capability of the modern-day signal processors to realize those algorithms efficiently have made it possible to dream of and realize highly sophisticated communication systems. The short-term course Signal Processing Applications in Communication Engineering will cover many of these emerging issues. Although certain progresses have already been made, there are numerous issues that require further investigations. Such topics will be discussed at length to motivate the participants to go for active research in those areas.</p> <p><u>Course Content</u></p> <p>Outlines of the broad topics that will be covered during the course are as follows:</p> <p>Adaptive Signal Processing Algorithms for Communication Engineering</p> <p>Detection of Signals in Presence of Noise</p> <p>Digital Signal Processing Applications in Wireless Communication</p> <p>Programmable Architectures for DSP Algorithms</p> <p>Multimedia Signal Processing</p>

			<p>The IEEE 802.11 System with Multiple Receive Antennas</p> <p>Broadband Digital Networks</p> <p>Network Security</p> <p>* Laboratory classes on some selected topics will be held regularly.</p> <p style="text-align: center;">COURSE MATERIAL</p> <p>Lecture slides and other reference materials will be provided on CD as well as in the printed form.</p>
3	Dr. S. Natesan Dept. of Maths	June 6 - 10, 2005	<p>Fundamentals of numerical computing</p> <p>With the advent of modern high-speed computers, the numerical methods have been successfully applied to study problems in mathematics, engineering, computer science, and physical sciences such as biophysics, atmospheric sciences and geosciences. Such problems may each be formulated, for example, in terms of an algebraic or transcendental equation, an ordinary or partial differential equation. The art of science of preparing and solving scientific and engineering problems have undergone considerable changes. Analytical solutions, when available, may be precise in themselves, but may be in unacceptable form because of the fact that they are not amenable to direct interpretation in numerical terms, in which case the numerical analyst may attempt to devise a method for effecting that interpretation in a satisfactory way, or he may prefer to base his analysis instead upon the original formulation.</p> <p>COURSE OBJECTIVES</p> <ul style="list-style-type: none"> · To provide preliminaries of numerical analysis · To make aware of various techniques to solve different types of problems · To introduce mathematical software like MATLAB, SCILAB, etc. · Applications of numerical methods to other fields of Science and Engineering

4	Dr. P. K. Iyer Dept. of Chemistry	June 20 - 24, 2005	<p>Semiconducting organics as future generation electro-optical materials</p> <p>COURSE OBJECTIVES</p> <p>To provide preliminaries of numerical analysis</p> <p>To make aware of various techniques to solve different types of problems</p> <ul style="list-style-type: none"> <input type="checkbox"/> . To introduce mathematical software like MATLAB, SCILAB, etc. <input type="checkbox"/> Applications of numerical methods to other fields of Science and Engineering <p>COURSE CONTENTS</p> <ul style="list-style-type: none"> o Types of Errors o Solution of Nonlinear Equations o Direct/Iterative Methods for System of Linear/Nonlinear Equations o Interpolation & Approximation o Numerical Quadratures o Numerical Methods for ODEs/PDEs o Software MATLAB, SCILAB, etc. o Computer Practical
5	Dr. S. Ravi Dept. of Physics	June 20 - 24, 2005	<p>Cryogenic engineering and cryogenic materials</p> <p><u>BACKGROUND</u></p> <p>The instrumentation pertaining to the production and storage of liquefied gases (cryogenes) and engineering design for specific applications at low temperature are called Cryogenic Engineering. The materials whose applications and interesting physical properties linked to the use of cryogenes are called cryogenic materials. They have applications in diverse fields such as scientific research, medical, industrial, space, fuel, rural sector, etc. With the advent of cryo-coolers based on Gifford-McMahon cycle, the research and development in cryogenics has increased manifold due its simplicity and cost effectiveness. The short term course is aimed at imparting up to date knowledge with series lectures and laboratory demonstrations on the above topic.</p> <p>COURSE OBJECTIVES</p> <ul style="list-style-type: none"> • To provide fundamental aspects of cryogenic engineering and cryogenic materials for the audience with different engineering and science background.

			<ul style="list-style-type: none"> • To highlight the up to date development on cryogenics and their applications in diverse fields. • To impart training on the handling of cryogenic liquid and cryo-coolers and, a few physical measurements at cryogenic temperature. <p><u>COURSE CONTENTS</u></p> <ul style="list-style-type: none"> • Production, storage, maintenance and transfer of cryogenes. • Cryo-coolers • Transducers at cryogenic temperature • Cryogenic instrumentation • Cryogenes and cryo-coolers in research and development. • Cryogenes in medical, industrial application and as energy source.
6	Dr. R. M. Puneekar & Dr. V. Prabhu, Dept. of HSS	Nov. 7 – 11, 2005	<p>Integrating humanities and social sciences in technical education</p> <p>Technology and the sciences have to function within the societal and the human framework. Not only does the technology student need to understand the importance of economics and finance in order to make technology viable, but he/she also needs to develop professional ethics, communicate with people, and understand social pressures and organizational structures. Moreover, in contemporary society, when human life is driven and shaped by technology, traditional barriers between subject disciplines are increasingly blurred. Many areas of humanities and social sciences are necessary to the scientist and technologist. This course will expose the participating teachers from technical institutions to the integration of Humanities and Social Sciences in technical education. This course is recommended for HSS teachers in technical educations and also for the teachers who wish to incorporate humane dimensions in their learning/teaching experiences. The topics that may be covered in this course are business economics, management principles, language and communication, philosophy of technology, ethics, cognition, and sociology of knowledge.</p> <p><u>COURSE OBJECTIVES</u></p> <ul style="list-style-type: none"> • <input type="checkbox"/> To expose the participants to the significance of Humanities and social sciences in technical education • <input type="checkbox"/> To improve soft skills through interaction and panel discussion. • <input type="checkbox"/> To broaden the scope and meaning of 'education' in order to enable an understanding of responsible citizenship

7	Dr. R.. V. S. Uppaluri Dept. of Chemical Engg.	Dec. 5 – 9, 2005	<p>Advanced chemical process design</p> <p>OBJECTIVES :</p> <ol style="list-style-type: none"> 1. To familiarize faculty members at other institutions with topics related to advanced process design. 2. To involve computer programming as an important tool in design calculations aiming at enhancing chemical process efficiency. 3. To decrease the gap between education, training and research and evolve for an integrated environment that facilitates the address of all issues related to process design. 4. To systematically introduce the concepts needed to follow for cost reduction, efficient utilization of raw materials and optimal process interactions.
8	Dr. Pinakeswar Mahanta Centre for Energy	Dec. 5 – 9, 2005	<p>Fuel and combustion technology</p> <p>OBJECTIVE</p> <p>Fuels are important from many different aspects. There are different types of fuel used for different purposes. Some of the fuels are costly and some of them are cheap. However, proper combustion of fuel is most important from the viewpoint of maximum utilization. It is always important to utilize proper technology for combustion of fuel such that consumers can avoid health hazards and also can attain high thermal efficiency. Some fuels, particularly fossil fuels, are not going to cater to the need for a long period as these are already exploited to the maximum extent. Further, fuel has a bearing on the economy of a nation too, so, it is pertinent to develop strategy for future utilization of fuel and relevant technology.</p> <p>COURSE CONTENTS</p> <p>Various sectors to be focused in the proposed short term course are 1. Solid, liquid and gaseous fuels 2. Future fuels/Fuel cells 3. Clean coal technology 4. Fluidized bed technology 5. Combustion of coal 6. Combustion of biomass 7. Combustion with porous medium The benefits of the course are manifold, viz., (i) The teachers would get the state of the art knowledge</p>

			about the best practices followed elsewhere, (ii) They can further disseminate the knowledge gathered to their students and also to the people of their reach, (iii) Teachers having interest to carry out further research can have a starting point.
9	Dr. G.S. Saravanakumar Dr. P. S. Robi Dept. of ME	Dec., 12 - 16, 2005	<p>Computer aided design and manufacturing</p> <p>Objectives of the STC</p> <p>Computer aided design and manufacturing in industries is growing at a fast rate in the past few years. Due to the requirement of a better quality of the product and the pressing time constraints, the need for the feasible design alternatives and its applications in the industries is required in the current era. Computer aided design; manufacturing and analysis technologies provide a valuable resource tool for the futuristic design. The emphasis of the Indian industry has shifted from technology absorption to product development. If this welcome shift has to be sustained and supported, the industry must have access to trained man-power that has the necessary skill set for design and manufacture. If more value addition has to take place in India, increasing manpower exposed to these tools and the underlying concepts is a must. If the Indian companies that are presently in this sector wish to move up the value chain, there must be a commensurate increase in the manpower available to them that is trained and well versed with the modern IT based tools used in design and manufacture. This knowledge can be transferred by the participants attending the short term course to the students and in turn everyone will be benefited from the above proposed short term course.</p> <p>Short term course covers most important aspects of design using the IT tools such as solid modeling/manufacturing/analysis software's as well as theoretical concepts of basic fundamental design coupled with the emerging trends in CAD/CAM area and their applications in various problems such as optimization techniques, Finite Element Methods, Kinematic analyses, mold manufacturing techniques etc.</p>
10	Dr. Rajiv Tiwari Dept. of M.E.	Dec. 19 -23, 2005	<p>Finite element analysis & signal processing in rotating machineries</p> <p>Teachers and professional engineers need to be introduced the fundamentals of Finite Element Analysis & Signal Processing in Rotor-Bearing Systems. Rotor-bearing systems of modern high-speed rotating machineries constitutes a complex dynamic system. With the advancement in high-</p>

			<p>speed machinery and increase in the power/weight ratio, the determination of the rotor dynamics characteristics through reliable finite element modeling has gained prime importance. The advancement in modern instrumentation, computational capabilities and numerical methods has helped in the analysis and vibration signal processing of these complex systems.</p> <p>In this course teachers/scientists/engineers are given a complete understanding of Rotor-Bearing systems and allied areas from very basic vibrations to advanced modeling, analysis and signal processing techniques. This course helps the participants in understanding the rotordynamic problems in practical situations. They will be to implement the ideas of modeling, simulation and techniques for dynamic analysis and signal processing in practical situations and for research purpose.</p> <p>COURSE CONTENTS</p> <ul style="list-style-type: none"> • Introduction to linear and non-linear dynamic systems, finite element methods and vibration signal processing. • Analysis in rotor-bearing systems: Critical speeds, unbalance response, gyroscopic effects and instability. • Bearings: Tribology of bearings – Fluid film and rolling element bearings. • Signal processing in rotor-bearing systems: Balancing of rotors, bearing dynamic parameter estimation. • Hands-on laboratory classes on dynamic balancing of rotors, bearing dynamic parameter estimation etc. • Hands-on laboratory classes on the MATLAB software package. <p>-</p>
11	Dr. (Ms.) P. Agrawal Dept. of Physics	Feb., 6 - 11, 2006	<p>Advanced experimental techniques</p> <p>COURSE OBJECTIVES</p> <ul style="list-style-type: none"> • To provide the latest developments in the advanced experimental techniques and their applications in Science and Engineering. • To provide first hand laboratory experience. <p>COURSE CONTENTS</p> <ul style="list-style-type: none"> • Emission and Absorption Spectroscopy • Surface probe Microscopy/Atomic Force Microscopy • Transmission and Scanning Electron Microscopy • Nuclear magnetic Resonance and Electron Spin

			<p>Resonance • Low temperature and Low Pressure Techniques</p> <ul style="list-style-type: none"> • X-ray Diffraction and analysis • Synthesis of Materials • Signal Processing and detection • Laboratory demonstration
12	<p>Dr. D. Chakrabarti Mr. Ravi Mukashi Punekar Dept. of Design</p>	<p>March 6 - 10,2006</p>	<p>Human interface in design and engineering</p> <p>Scope</p> <p>Application of best scientific principles and appropriate technologies may generate a design best to deliver its intended function, still its user, (the prime system component), ultimately has to feel comfort while using it to qualify the same to be a good design/ system. Optimum human resources using information about people one can achieve maximum comfort, functional efficiency, and safety, which can be practiced through appropriate applications in design and engineering. Over the years there have been considerable development in Design- User- Context Interface and such techniques are being applied to a wider range of fields.</p> <p>The objectives of this course are to familiarize the participants with the latest developments in the field .</p> <p>Course intends to cover</p> <p>The course will give a broad coverage to theory and application aspects in the following areas:</p> <ul style="list-style-type: none"> Introduction to Human Factors Engineering Aspects of Industrial Design, Usability and safety in design and engineering Ergonomic application guidelines and criteria Human compatible design development Human factors evaluation methodology and technique.

Information on Curriculum Development Cell 2005 - 2006 under QIP:

The following CD Cell projects for financial year 2005 – 2006 under QIP Scheme were undertaken:

Sl. No.	Name of the Proposer & Dept.	Type of project	Title of the project	Expected time of completion
1	Prof. P. K. Bora Dept. of ECE	Lecture notes	Digital Image Processing	One year
2	Dr. Braj Bhushan Dept. of HSS	Text Book	Cognitive Psychology	Two years
3	Dr. Manmohan Pandey Dept. of ME	Lecture notes	Two-phase Flow and Heat Transfer	One year
4	Dr. Vijayanand S. Moholkar Dept. of Chemical Engg. & Center for Energy	Lecture notes	Principles of Fluidization	One year
5	Dr. Lingaraj Sahoo Dept. of Center for Energy	Lecture notes	Bioenergy and Bioconversion	One year
6	Dr. P. Mahanta Dept. of M. E.	Lecture notes preparation Power-point presentation	Course Material on Energy Conservation & Waste Heat Recovery	One year
7	Mandar S. Rane Dept. of Design	Teacher's Manual	Visualization Drawing	One year
8	Dr. P. K. Giri Dept. of Physics	Lecture notes	Physics of Semiconductors	Two years
9	Dr. Charudatt Kadolkar Dr. Gin Jose Dept. of Physics	A web based course	Numerical Methods and Programming	One year
10	Dr. U. K. Saha Dept. of M. E.	Lecture notes	Course Material on Internal Combustion Engine	One year
11	Dr. Anil Mahanta Dept. of ECE	Lecture notes	Digital Communication	One year

EARLY FACULTY INDUCTION PROGRAMME (EFIP)

PREAMBLE :

The quality of technical education basically depends on the quality of teachers. Adequately qualified, highly competent and motivated faculty is becoming scarce in technical institutions all over the country. The shortage of faculty has become more acute due to rapid expansion in technical education. AICTE is giving a high priority to attract bright young persons to teaching profession. In order to attract bright engineering graduates to teaching, MHRD operated the "Technical Teachers Training Scheme" in 1950's and 60's. With similar objectives, AICTE has taken an initiative to launch a revised programme "Early Faculty Induction Programme (EFIP)" with distinct features. The scheme aims at attracting bright young graduates in Engineering & Technology pursuing PG Programme to take teaching as their career by providing certain incentives.

OBJECTIVE :

In the Early Faculty Induction Programme, bright young Engineering & Technology students pursuing in their PG programme (M. Tech. or Ph.D) will be selected and will be given an opportunity to take up teaching career in Engineering Colleges.

ACTIVITIES :

For EFIP-2004 scholars and QIP students a *Pedagogy and Teaching Skill* course was organized during 23-25 March 2006.

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