

**PROPOSAL FOR CONDUCTING
COURSES FOR ENGINEERING COLLEGES
THROUGH BROADCAST MODE
UNDER EDUCATION GRID / VISTA**

**Submitted to the
Department of Higher Education
Government of Kerala**

**Project Report Prepared by
Prof. K.R. Srivathsan, Coordinator – Kerala Education Grid
and Director IIITM-K**

March 2005

1. MOTIVATION FOR THE PROPOSAL

In the meeting of Principals of self-financing and private engineering colleges with the Principal Secretary Higher Education held on Feb. 19, 2003, all present collectively expressed concern about the acute shortage of quality teachers. More than 40 new engineering colleges have come up in the last few years across Kerala. Even the older colleges have shortage of quality teachers in several subjects. The shortage is even more acute in the professional subjects for the senior years of the B.Tech. program. Partly in answer to this, the Government of Kerala commenced the Education Grid project as per the proposal submitted by IIITM-K. Since then Education Grid project worked on several parallel sets of activities as given below.

- i) To establish the necessary ICT infrastructure like networking, servers, information systems, digital library and other necessary software systems and tools. Towards this the project works closely with ERNET, UGC and ISRO.
- ii) Establish resource centres at IIITM-K, CET, CUSAT and NIT-C for building competency in content development, large information and network systems maintenance and using such systems in regular education.
- iii) Work closely with appropriate academic institutions like the IITs and the MHRD's National Program on Technology Enhanced Learning to generate quality content by the best of academicians in the different subjects needed in the engineering colleges.
- iv) Conduct awareness and training programs for the college teachers in the art of instruction and use of technology enhanced learning in their classes. Several invited seminars and short courses by experts from the IITs and IISc are being conducted.
- v) Conduct special courses in areas like network and information systems management for professionals who manage such resources in the institutions. Considerable competency building, technology developments and their deployment have taken place under the project.

Although many activities as indicated above have been going on, they do not directly address the immediate concern of supporting the colleges for overcoming the acute shortage of quality teachers. **This proposal provides a refreshingly different attempt to provide quality instruction in the professional subjects of the engineering curricula by involving the Education Grid and the NPTEL group of IITs and IISc.** The approach is delineated in Section 3. Before that we briefly review related initiatives and activities that are taking place in the country to address this problem.

2. INDIAN INITIATIVES IN IMPROVING QUALITY OF PROFESSIONAL EDUCATION

In recent years India has opened and set up a large number of professional colleges, particularly in the engineering and technology areas. Even within this, the IT related education got a big thrust through the MCA programs and IT courses. Although this initiative has catered to the quantity of seats available in the professional subjects, the issue of quality therein has not been attended to.

The different states and the centre have responded to this challenge of quality in technical education in a mixed way. The first are the initiatives in some of the states to open Technical Universities. Anna University and Karnataka's Visveswarayya Technical University are examples of such initiatives. Till date, the Technical Universities have taken a regulatory and centrally managed examination – evaluation approach. Such approaches do not address building the capacity for better education or equipping and nurturing the teachers and the system to provide quality education. Some of them like the Visveswarayya Technical University have started broadcasting live classes via satellite in some engineering subjects to the colleges that do not have experienced or knowledgeable teachers. Andhra Pradesh SONET is also launching such an initiative. With the promised ISRO EDUSAT services spreading across the country, more and more states may wish to undertake a similar effort.

There has been some demand in the state for the creation of a Technical University. If we carefully review the performance and problems of the older technical universities, study them in the light of modern developments like broadband connectivity, ISRO's EDUSAT based educational broadcast, networked education services, and local initiatives such as the Education Grid and MHRD's NPTEL initiative, it appears that an enabling approach rather than a regulatory model is the best suited. Hence, we recommend that in the Kerala context, instead of taking a regulatory approach for which the existing universities and AICTE are already equipped, we address building competency and capacity for quality professional technical education using the methods outlined in the next section. To get a quick start, what we need are approved formal programs under technical education in the format proposed in the next section.

3. VISTA AND PROPOSED APPROACH FOR QUALITY EDUCATION

VISTA has the objective of reaching quality education to all independent of geography. Its vision is: **"Enable, Educate and Empower Every Citizen and Community Through Knowledge"**. The approach suggested here is to ensure that the teaching system in the colleges as a whole is benefited and strengthened by the adopted processes. The colleges

need quality teachers in increasing numbers. We cannot afford to look at the fact that teachers need years of apprenticeship to become good researchers and good guides. We also need to build career incentives in to the system that will later result in making teaching in the colleges a quality and sought after profession for bright scholars.

The proposed approach for the management of broadcast and net-supported quality education is based on the four quality dimensions that we need to impart quality learning in the students and teachers of the professional colleges. The four quality parameters are

- i) **Quality web-accessed resources:** This is well supported by the Education Grid portal. Necessary web-content in each course will be made available for students and teachers alike. It will have asynchronous discussion forums, frequently asked questions, self-test quizzes for students to assess themselves about the level of their understanding, linked digital resources over the web and similar facilities.
- ii) **Quality of Instruction:** This is to be achieved by several interrelated processes and activities as given below.
 - Broadcast of lectures from experts recorded in the IITs under NPTEL over TV/IP Streaming/ EDUSAT channels.
 - Live interactive class sessions conducted by local expert teachers.
 - Experts group appointed in each course to guide and train college teachers, answer students' queries over the course portal, examination design and evaluation guidance.
- iii) **Quality of efforts by students:** Students will get supplementary, reference and study materials, homework and exercises through the course portal. Teachers in the colleges will be given a priori exposure to the homework and answers so that they can face the students comfortably. Teachers will have support and interaction with the expert group through the Course Portal.
- iv) **Quality learning ambience:** All students will have access to the Course Portal and its associated Learning Management System for the course. They will be able to interact asynchronously among themselves through discussion board services. They will also get expert group's guidance by way of recommended learning activities and study exercises. The course portal will guide them to course related activities and industries interested in the subject.

All efforts will be taken to ensure that the above four quality parameters of learning are promoted in every course. In summary, the aim of the VISTA approach is to provide a fairly

comprehensive quality learning environment combined with the discipline of the classroom – exam processes targeted at every learner in each course. The processes adopted are aimed to conform to existing university regulations while enhancing the resources position for all concerned. It also achieves the objective of making every learner understand the course in the context of real-world issues. The goal is to produce employable graduates capable of performing useful functions in their chosen profession.

4. NPTEL CONTENT FOR THE ENGINEERING COURSES

The National Program on Technology Enhanced Learning [NPTEL] is a result of a proposal jointly submitted to the MHRD by the IITs, some IIMs and IISc in 2000. It was called the Virtual Centre for Technology Enhanced Learning, or VCTEL. MHRD funded the IITs and IISc to execute the program as NPTEL by 2003. Under NPTEL, the IITs and IISc were to prepare both video and web-based course material in at least 100 courses of relevance to the engineering colleges. By late 2003 the seven IITs and IISc worked out the modalities of producing the content and division of responsibilities. The content broadly conforms to the AICTE recommendations and typically in use in large universities like the Anna University.

Currently about 120 courses in video recorded form (of approximately 40 lectures per course with some supplementary material) and 114 courses in web-based form are getting ready. Several courses have both web-based and video content. Nearly 240 faculty of the IITs and IISc are involved in the production of this large work. About half this content will be formally released by July 2005 and the rest by Dec. 2005.

We may note that the Ekalavya satellite TV channel of Doordarshan broadcasts some of the courses recorded earlier by some of the IITs. It has been found useful by many teachers and interested persons to learn informally. However, what we are attempting under this VISTA proposal is to integrate more tightly and synchronize the education broadcasts with the schedules in the colleges and support them by web-based interactions and evaluation processes.

5. DETAILS OF COURSE MANAGEMENT PROCESSES

There are several issues and processes involved in a broadcast and network based delivery and management of formal courses. Different parties and organizations need to understand their roles and how they relate to each other. We also need to create such groups and people with back-office support that manage the program. The whole technology behind the process has to be as much transparent as possible to the users, the teachers and the

college system. The process should be acceptable to the university system for the students to get formal credit for the courses. The process should be managed such that it creates capacity and competency in the less experienced teachers to graduate to a level so that they become competent teachers in the future. In other words, teacher training is built into the process even as the shortage of teachers is addressed through this method. The suggested approach in this proposal takes into account all these considerations in the design of the instruments and processes of Education Grid based learning management.

When we conduct a typical semester long full course, we typically have about 40 lecture hours, about 12 problem solving or case study classes, associated homework, mid-term tests, end-term exam and final grading. In well-conducted courses, the students will do additional study through term papers, field or group exercises. Practical sessions will be conducted in courses where it is mandated. Fortunately the daunting task of preparing video recorded lectures and web based material in a substantial number of courses has already been done under the NPTEL. Based upon this we shall manage the courses as follows.

5.1. STATE TECHNICAL EDUCATION CONSULTATIVE COUNCIL

We recommend that an apex state level body to supervise and work with the stakeholders in the program is formed as given below.

1. Principal Secretary – Higher Education - Chairman
2. Director, VISTA - Program Director
3. Director Technical Education - Coordinator and Convener
4. One representative experienced academician nominated by the Head of Institution from each of the Education Grid Resource Centres at VISTA, College of Engineering Trivandrum, Cochin University of Science and Technology and National Institute of Technology – Calicut.
5. One academician each nominated by the Vice Chancellors of the M.G. University and Calicut University. CET represents the Kerala University. CUSAT already has a representative.
6. One each from IHRD and such bodies having fair number of colleges under them.
7. One representative from the self-financing private colleges

The above body may be called as the State Technical Education Consultative Council [STECC]. STECC will formulate the policies and recommendations. The Principal Secretary as the Chairman and DTE as Coordinator will take necessary steps to ensure that the respective universities and institutions act upon its recommendations. STECC will have a

dedicated back office in VISTA to carry out all the necessary official tasks related to the program management.

5.2. CHOICE AND MIX OF BROADCAST CHANNELS

Three types of video broadcast channels are available. The first is the Cable TV channel that reaches many homes as well. The second is the promised EDUSAT satellite channel. Third is the IP stream multicasting over leased lines and VPN. There is delay in getting EDUSAT Channel. So our first preference will be for the Cable TV Channel. The VPN/leased line solution requires some trial installation and verification for compatibility with the EDUSAT approved technology. It will be useful to have the VPN/leased line for reaching colleges where the cable TV is not reaching.

During the working days and hours of the colleges, we have about 6 hours per day X 5 days per week, totaling 30 hours per week for the broadcast classes. Typically we need in every week 3 hours of recorded lectures broadcast with one additional hour of interactive session by a member of the Course Expert Group. This gives a capacity of about 6 to 7 courses per Cable TV channel. Cable TV is also very useful to allow for repeat telecasting in the holidays and non-working hours for the students to view from homes.

Quality of Cable TV channel is much superior to EDUSAT as the latter uses high degree of video compression to accommodate a large number of channels for use across the country for a variety of educational programs. In the long run, it is best to have a few EDUSAT channels both for regular classes and other formal/non-formal educational programs. In addition, we shall have one Cable TV channel for reaching programs to homes, to broadcast seminars by experts and for lessons involving rich illustrations and field shootings.

5.3. OVERVIEW OF COURSES MANAGEMENT

There are several steps and roles to be performed in managing broadcast and net-based classes. These are outlined below.

1. Choice of courses to be offered: This is to be done based on (i) course content availability and (ii) the demand for such course based upon the needs of the colleges. We suggest that initially we offer senior years engineering courses and independent soft-skills courses. The choice will be approved by STECC.
2. Course Expert Group: For each course we appoint a 3-member of course expert group from the best academicians available. They may be from the institutions

hosting the Resource Centres of Education Grid or experienced academicians in the state. One of them will be nominated as the Course Director and the other two as Associate Directors. They will be given formal responsibility for the overall course management and evaluation processes.

3. Broadcast classes schedule management: The schedule of broadcast classes will be announced to all concerned colleges in advance and posted in the Edugrid Portal (www.edugrid.ac.in). The schedule will be maintained by VISTA from its Technopark location.
4. Portal based supplementary content dissemination and interaction: The Education Grid Portal will host a portal for each course. The facilities will include support for web-based course content, self-testing, homework distribution, FAQ and discussion boards for students' interaction.
5. Interaction services management: The Course Expert Group members will be assigned the responsibility to moderate the discussions on the subject discussions board. Every week one of them will be taking a live interactive class session where common doubts arising from students will be cleared and case studies/worked out examples presented.
6. Teachers Orientation and Support: The course management process will involve and engage the available teachers in the colleges. The college management will assign a suitable teacher in each subject conducted in broadcast mode. The teachers will act as facilitators monitoring attendance of students and participate with them in local interactive discussions. They will have private discussion area in the Edugrid Portal for clarifications of their doubts and as well make their contributions. The Course Expert Group will provide the teachers with necessary clarification and information of value for their class management. The long-term aim is to make the local teachers experienced to teach such courses on their own.
7. Examination and Performance Evaluation: The Course Expert Group will distribute mid-term papers and model solutions over the portal and in private to the teachers for conducting tests locally. They may be evaluated locally or sent to the nearest Resource Centre for evaluation. The final exam papers may be set by the university or by the Course Expert Group as per the NPTEL material covered in the broadcast classes.

8. Back Office Support for the courses: The VISTA Centre will assign two well-trained engineers/professionals per course to provide the support for the Course Expert Group and for managing the diverse events associated with the course.

To ensure the many dimensions of course management as outlined above, we need a functional structure with well defined responsibilities. These are stated in the next section.

5.4. ROLES AND RESPONSIBILITIES OF DIFFERENT STAKEHOLDERS

The parties involved in the open broadcast classes for the engineering colleges are as follows.

- i) Concerned Colleges: The colleges will have the option to choose the courses or not to choose them at all depending on their faculty strength and needs. Once they choose to be a member of this VISTA program, they will sign an agreement with the VISTA and the DTE. They will have to be adequately equipped to receive the broadcast classes and interact over the net with other learners and experts through the course portals.
- ii) VISTA: The VISTA centre located at Technopark will do the necessary coordination of the lecture broadcasts, back office services, publicity and support for the different course expert groups.
- iii) Education Grid Resource Centres: The Resource Centres at CET, CUSAT and NIT-C will be equipped in due course to take responsibilities for course scheduling, assigning expert teachers and participate in interaction and evaluation related processes.
- iv) Higher Education and DTE: Will provide the enabling policy framework and coordination with the colleges and the university system for the acceptance of the new mode of courses delivery. Will ensure that necessary directives are given to the colleges and universities for the smooth operation of the program.
- v) NPTEL, IITs and IISc: VISTA to have close working relations with them. Their faculty will be involved in different ways – as subject experts to interact as mentors in the courses, support teacher training and work towards establishing web-based resources and computational facilities.
- vi) The Universities: Since they are the statutory authority in awarding the degrees, recognizing the courses, associated syllabus and evaluation processes, it is important to have them accept the recommendations passed by the STECC. VISTA will take

necessary steps to communicate the course syllabus, course and evaluation processes in advance to the concerned university bodies and seek their approval.

- vii) Relations with Cable TV, Network Providers and ISRO – EDUSAT: The course processes and delivery depend on fairly high-tech broadcast and network services. Hence a technology support team will be available under VISTA. This team will closely with the services providers like the Cable TV channel, ISPs, ERNET and EDUSAT to maintain high reliability and uptime of the broadcast and network services.

The success of the program needs effective management of several functions at different levels. A program management and operational guidelines book with web support will be prepared for reference purposes. This book will provide the guidance on how different issues will be addressed by VISTA and other concerned parties.

6. INCENTIVES, FACILITATION FOR OPERATIONAL PERSONS AND COURSE MANAGEMENT COST RECOVERY

The key persons who have to manage the broadcast and net based classes are (i) members of the Course Expert Group for each course, and (ii) the back office persons maintaining the course portals and the network systems. Here we suggest the following constitution and remuneration for the Course Expert Group.

Each Course Expert Group will have three senior and well-experienced academicians chosen from the engineering colleges. One of them may be a retired but active person in the subject. One of the three will be nominated as the Course Director, and the other two the Course Associate Course Directors. The Course Director will be fully responsible for the overall management of the course, including overseeing the evaluation processes. The suggested remunerations for the entire duration of the course are: Rs. 30,000 for the Course Director, and Rs. 25,000 for each of the two Associate Directors. Besides, they will be given a broadband Internet connected PC facility at home for the entire course period plus one month before and after the period. This will enhance their capacity to manage the students queries and other interaction functions.

The Course Expert Group will deliver one live interaction session in each week of the broadcast classes. We expect the courses to be delivered and completed over a typical semester duration of four months.

The engineers supporting the course will be given Internet connection at home for the smooth management. They will be employed full time under VISTA. The systems and network administrators will be IT professionals employed under VISTA. They will get both a mobile phone and Internet facility to help them attend emergencies efficiently.

7. PREPARING THE COLLEGES FOR THE BROADCAST CLASSES

The colleges will need the following set of implements to make effective use of the broadcast courses.

- (i) Cable TV connection to link a few large screen color TV sets or projection TV to receive the classes. A 29" or 33" TV set for a group of 12 students will be adequate. Four such sets will cover a class of 48 students.
- (ii) One PC with TV adapter card, Ethernet and linked to a high power LCD projector installed in a proper lecture hall. This will allow both large screen projection of TV broadcast seminars and EDUSAT lecture broadcasts.
- (iii) A VPN / leased line Internet connection of minimum 512 kbps for accessing the Education Grid portal services, Digital Library subscriptions and other Internet services.
- (iv) EDUSAT terminal ground equipment as and when available.
- (v) ERNET subscription to access global Internet and benefit from UGC / INDEST journals access. The subscription rates will be as set by the ERNET time to time.
- (vi) An Education Grid access facility of networked PCs over LAN for the teachers and students to access the Education Grid portal and Internet.
- (vii) Associated UPS and back up generator facility for uninterrupted reception.

The essential ones to get started are items (i), (ii) and (iii) above. The others will be added as and when the resources become available or subscribed for. Many colleges are already equipped for (vi) and (vii). A college will have to invest about Rs. 6 Lakh to get started.

7.1. PREPARING THE VISTA MASTER TEACHING CENTRE

The Master Teaching Centre will be located with the Education Grid Operations Centre in Technopark under VISTA. This requires full-fledged master teaching classroom equipped with TV recording and live interactive broadcasting facility. It will be equipped to support (i) broadcasting from pre-recorded DV-CAM tapes; (ii) lecture studio based live interactive TV

broadcasting; (iii) necessary video mixing and editing facilities and (iv) Streaming server and live IP streaming facility; (v) portal management and content development services. The facilities are budgeted under the VISTA establishment and EDUSAT facilities. The estimated cost is around Rs. 150 Lakh. This will include the site preparation to host the back office for the courses and portals management. VISTA may also use the studio facilities available with parties like the Asianet Cable Vision. This is different from the Asianet TV that hosts the commercial TV studio.

How much will it cost for the student to take up courses in the proposed style? We assume a conservative figure of 30 colleges willing to adopt this with about 35 students per course giving a total of 1000 students. The course management expense is taken to be Rs. 5.00 Lakh per course of one-semester duration. It appears reasonable to charge Rs. 500 per student per course for the VISTA services. The projected cost does not take into account the expenses incurred in the college end and the cost of examinations and evaluation. We expect the same to be covered in the student's fee. We expect that any student will take not more than one or two courses in this mode. If the same course is taken under open learning, we may charge Rs. 5,000 per course of theoretical nature. Practical part will be charged separately. Open learning students may register in neighborhood college to do their practical in the late hours.

8. CONCURRENT TEACHER DEVELOPMENT PROGRAM

This proposal is aimed at overcoming the present acute shortfall of quality teachers in many of the professional engineering courses across the large number of engineering colleges in the state. Here we also suggest a process by which this program will lead to developing competency among young inexperienced teachers. This will be integrated into the program. We believe that quality education is best driven by quality teachers equipped with quality systems to support them. There is much more to teaching and students interaction than the syntactic necessity of the syllabus – classes – exams – marks approach of today. Also good teachers are major assets to both colleges and the society at large. Capable teachers must have a career growth path of becoming deeper academicians and consultants. They should be able to drive postgraduate education, research and consulting services. We assume that a teacher will be qualified as per AICTE or UGC norms at the level of junior lecturer or lecturer. Here below we outline the integrated teacher development program built into the broadcast courses process.

- i) Each college will assign a teacher for the course. The teacher will have some background in the course.
- ii) Each assigned teacher will form a team, or community of practitioners with the fellow teachers in the subject from other colleges. The Course Expert Group will also perform the role of mentors for this teaching community.
- iii) This community will be brought initially to VISTA (or one of the resource centres) and given a thorough orientation to technology enhanced learning methods and an overview exposure to the NPTEL course content in the respective subject. If necessary concerned Professors from the IITs may be brought to conduct this exposure course.
- iv) The community will get support from the Edugrid Portal to discuss among themselves in privacy through group discussion boards and other tools. They may ask their doubts or request supplementary study resources for the course.
- v) The homework exercises and solution to the same will be delivered through the net to the teachers for distribution to the students.
- vi) In the college, the teachers will monitor the attendance and interact with the students. They too will sit with the students in the class during the broadcast lectures.
- vii) The members of the teaching community will be encouraged to take a test in the course. This test will have a broader scope than the one for the regular class. The Course Expert Group will conduct and evaluate the test. This test may be taken at a pace different from the regular class.
- viii) Those teachers who have done well in the test will be asked to prepare and come for a seminar and oral examination. A peer group of eminent academicians will evaluate the teacher's performance.
- ix) The teacher will be asked to prepare web-content for a module in the given course. On satisfactory completion of the oral test and the web-content design, the teacher will be given a VISTA Certificate of Qualified Instructor in the subject.
- x) If a teacher gets, say, three such certificates, he/she will be given incentive by way of promotion to lecturer – senior grade, professional society membership fee and Internet at home as a professional perk. He may be declared to have become a Principal Instructor in the subject area.

- xi) A Principal Instructor may become a mentor or a member of the Course Expert Group and also a certified instructor for continuing education to industry and other sectors.
- xii) The certificates may be improved upon by doing three more online or registered courses and a project dissertation of a review of state-of-the-art in the subject. This will confer the teacher an M.Phil. degree under the VISTA. Such a teacher may move up to the Reader level. This may be topped by a Ph.D. (it will be easier to do so as the teacher will have rich background experience for research while doing the proposed M.Phil. as stated above) by doing some more work.

The career growth path as given above forms a natural part of learning while doing their work, making it a natural part of their profession. Such certified teachers will get many more opportunities in their future.

9. EXTENDING THE PROPOSAL BEYOND ENGINEERING COURSES

This methodology of conducting and managing the broadcast classes for the engineering colleges as given in this proposal has the intrinsic merit of bringing the four quality parameters as outlined in Section - 3. It is the second best we can do in the absence of genuine intensive 24X7 campus learning environments in institutions with high quality faculty who are motivated and good resources. The proposed approach outlined here is the best option for the large number of colleges with inadequate teachers.

On a second look, we may note that the proposed approach is also the best thing we can do for the large number of aspiring young learners. The methodology reaches out even to those who do not get admitted in good institutions. We may introduce the concept of majoring whereby learners may learn from homes and offices in specific courses, subject themselves to the same type of rigorous examination as regular students and get credit under open learning. Hence open learning or Open University courses may be derived as a byproduct of this initiative. Further under the VISTA model, any of the premier institutions or universities in the state may adopt this model and offer elective courses concurrent with their regular courses in their respective colleges.

The present approach effectively leverages on the very large efforts put in by the IITs and IISc under the NPTEL to produce quality learning materials. We in the learning profession know that in most of the subjects like basic sciences and engineering, there exists the body of knowledge that does not change much with time. Hence what we teach is not so important as to how we teach the subject. If we invest our efforts in creating course

materials as the IITs/IISc have done in other subject areas like Health, Arts, Agriculture, Commerce, Law, etc., we will be in a position to open this mode of learning to all in any subject. A set of courses of great immediate value will be in the soft skills area. This is best offered under the larger umbrella of VISTA as we are planning similar programs under industry – induction training.

With a collection of existing institutions and universities in the state cooperating under the larger VISTA concept, we shall thus be in a position to make 'quality education to all independent of geography' a reality.

Submitted by

[K.R. Srivathsan]

Dated: 15 March 2005

To

Principal Secretary – Higher education

Secretary IT

Director of Technical Education

Director of Collegiate Education

Vice Chairman - Planning Board