

## **The JSS-Wilkes Scholars: A Unique Engineering Program in International Cooperation**

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### Abstract

We are entering the new century in the midst of a technological revolution potentially more profound in its impact socially, politically, economically, and educationally than the industrial revolution of the last century. We have scarcely begun to identify its implications and adapt our institutions to change, although the first massive repercussions already have been felt with diminishing geographical boundaries, a highly diverse work force, an elevated educational profile, and rapid communication and dissemination media. J.S.S. Mahavidyapeetha Educational System of India and Wilkes University of the USA intend to meet the challenge of the new century by developing and implementing a joint educational venture favoring an integrated approach to engineering curriculum. An approach that will provide a learning environment and instructional strategy between two organizations halfway across the globe separated by cultural differences, educational traditions, and management styles. The project is self-supporting and funded entirely by the two institutions, which is a critical ingredient for the success of this cooperative venture. The obvious reason was to avoid unnecessary constraints that may be imposed implicitly or explicitly by a third party. The underlining reason, however, is to ensure the total commitment and support to this demanding project by the constituencies of both institutions. This paper reports on the current status of the program -- its development and implementation, and its approaches to assure success and circumvent administrative obstacles and cultural barriers.

### I. Introduction

Jagadguru Sri Shivarathreeswara Mahavidyapeetha (J.S.S.) was established by Jagadguru Dr. Sri Rajendra Mahaswamiji in 1954. J.S.S. is an educational system composed of many institutions and colleges located throughout the provinces of Karnataka and Tamilnadu and New Delhi. J.S.S. offers a variety of graduate and undergraduate degrees in fields and professions including pharmacy, medicine, engineering, the arts and the sciences. Wilkes University is a private, co-educational, comprehensive institution of higher education located in Northeastern Pennsylvania, on the western edge of the Pocono Mountains Region with an on-campus enrollment of 2000 undergraduates and 400 graduate students. It offers degree programs ranging from engineering and pharmacy to history and music.

J.S.S. believes in the tradition of Gurukula (home of the teacher) where students have easy and frequent access to their teachers to be engaged in dialogues in the advancement of knowledge and to receive guidance in spiritual and philosophical matters. The teacher-scholar (or guru) is thus a trusted counselor and adviser-mentor. This philosophy of education meshes well with the educational objectives of the professional programs at Wilkes University where the craftsman-apprentice relationship describes the interaction between the student and the faculty member. One of the foundations of the Wilkes mission, *The Marks of an Educated Man*, encourages international academic cooperation and cultural exchanges <sup>1</sup>. The University has provided the academic environment and the administrative support to ease the academic and cultural adjustment of its international student population. The Wilkes community is well aware of the importance of cultural and educational diversity as an ingredient of the life-long learning process.

The educational objectives of J.S.S. and the mission of Wilkes complement each other. Both institutions are private and independent and they are aware of the necessity for cooperation. A cooperative venture that is intended to provide students and faculty from India with opportunities for modern educational choices and scholarship, and provide US students and faculty with options for joint research and multi-cultural experiences. This joint project will provide a viable environment that will enable the student to succeed in the community of the new global economy by emphasizing the collaboration between professional programs, the utilization of technology, the principled application of knowledge, and the entrepreneurial spirit.

In keeping with the aforementioned statements, J.S.S. and Wilkes articulated their respective interests in a 1999 Memorandum of Cooperation <sup>2</sup>. The MOC is a detailed document where both institutions agreed to undertake an educational experiment built on mutual cooperation and understanding. Primarily, this cooperative effort is reflected in the six goals of the project. Namely,

- (1) The establishment of a novel 3-1 transfer protocol from J.S.S. to Wilkes engineering.
- (2) The development of a US-style engineering curriculum at J.S.S.
- (3) The establishment of a student exchange activity from Wilkes to J.S.S.
- (4) The encouragement of institutional faculty and staff exchange activities.
- (5) The pursuit of joint research, publications, conferences and seminars.
- (6) The conduct of special short-term educational programs.

While this paper addresses Goal-1 of the agreement as it applies to the undergraduate engineering programs, the paper shows why Goal-3 and Goal-6 were relevant to the success of Goal-1 and why they were initiated ahead of their respective schedules.

## II. Institutional Commitment

Institutional commitment guided by a clear strategy and operational detail is the major factor affecting the success of a project between two organizations halfway across the globe separated by cultural differences, educational traditions, and management styles. The MOC articulates to a great length the various levels of responsibilities of each institution. It includes, for example, a 6-year (2000-2006) budget outline that was approved at the highest level of each institution. The outline defines the financial obligations as to underwriting of scholarships, project management, development expenses, and other costs associated with faculty additions and laboratory upgrade and support.

The MOC also assigns tasks and authority of relevant institutional offices associated with the project. For example, the program P/I while responsible for the management of the project, is specifically required to develop an implementation plan for Goal-1 and Goal-2 with recommendations on curriculum, financial projections, and assessment tools. These recommendations should be within the articulated boundaries of the Accreditation Board for Engineering and Technology (ABET EC-2000). The MOC document directs J.S.S., as a part of its on-going commitment, to allocate adequate funding and support for the implementation of Goal-2 as it unfolds in India including facilities, equipment, personnel, etc.

## III. The Transfer protocol

Developing today's engineering curriculum involves a team of experts who require access to modern equipment and real-life issues relevant to national and industrial needs. Accordingly, the J.S.S.-Wilkes cooperative project addresses the implementation of a unique 3-1 transfer protocol leading to a Wilkes Bachelor of Science degree (BS) in a give engineering area. While most traditional transfer agreements between institution are of the 1-3 or of the 2-2 type, the J.S.S.-Wilkes protocol advances this concept to a 3-1 format. The program is designed to affect a seamless transfer of 30-40 students who successfully complete 3-years of study at J.S.S. and matriculate at Wilkes for at least 1-year to complete the Wilkes degree requirements. At this stage, the program addresses the following Wilkes engineering fields and their various concentrations:

- (1) Applied & Engineering Sciences (starting 2002).
- (2) Electrical Engineering: Communication Systems; Computer Systems; Electronics and Controls; Microelectronic (starting 2001).
- (3) Engineering Management: Electrical; Environmental; Mechanical (starting 2002).
- (4) Environmental Engineering: Air Pollution; Hazardous Waste; Water Treatment ; soils (starting 2001).
- (5) Mechanical Engineering: Feedback & Controls; Manufacturing; Solid Mechanics; Thermal Sciences (starting 2001).

In addition, an integrated Bachelors/Masters degree program BS/MSEE and BS/MBA was also included as an option for interested and qualified candidates.

In order to achieve this type of transfer, it is logical to consider first the differences and the similarities between the two institutions and their educational and curriculum structures. For example, the Indian system provides for strong 'state' input while the US system reflects a more 'state-independent' philosophy. The variation in program structure exists even between the engineering college in New Delhi, which is in a different region than the one that governs the Bangalore and Mysore engineering colleges. Consequently, all universities (including private universities) within a defined region, are required to submit to a 'state-wide' common final exam in addition to the individual institutional exams. Specifically, the J.S.S. engineering programs have the characteristic of being highly focused and explicitly defined for each area of specialization. On the other hand, the Wilkes engineering programs are based on a common foundation upon which specific concentration areas of specialization are constructed.

The transfer protocol for the J.S.S.-Wilkes Scholars program calls for the development of a realistic and viable program equivalency procedure governing the first three years (6- semesters) at J.S.S. and the explicit definition and itemization of the remaining requirements for the completion of the degree at Wilkes. The equivalency procedure can be defined as a guide by which the student work at J.S.S. can be assessed. Such a procedure must be professionally acceptable, traceable, succinct, and clear to all the constituencies. To develop such a procedure four issues need to be addressed: Course/Program Equivalency Protocol, Grade Assessment Protocol, Quality Assurance (the ABET factor), and the Educational Environment. All of which will be individually addressed.

Student assessment and acceptance process for this program starts with the Project P/I who compiles the data received from J.S.S. and prepares a report with recommendations on each candidate. The report is based on academic performance at J.S.S., scholarship, communication skills, and on activities outside the classroom. The academic performance is based on course/lab equivalency and grade assessment protocols.

The respective Wilkes department reviews each report and acts in accordance with the departmental standards. The file of the approved candidate is forwarded to the dean of Enrollment Management who reviews the file for consistency with the institutional policies and issues the appropriate admission letters and documents.

### III. Course/Program Equivalency Protocol

There is no question that proper curriculum and credit evaluation is a major step -- but it is time-consuming. It is acknowledge that the underlining objective of an equivalency process is to identify matching subject matter and the content of two programs. The initial assessment revealed that in this specific case the traditional course-to-course equivalency approach is neither feasible nor realistic. For all practical reasons, this approach to equivalency is difficult even in the case of different US programs. The J.S.S. students are selected from three engineering colleges located in three different regions. The colleges while providing similar programs they do not follow similar program outlines. Consequently, the traditional approach of course-to-course equivalency was abandoned in favor of a collective group course-to-group course equivalency scheme.

The development of an equivalency guide starts with the compilation of a portfolio that includes among others course/lab syllabus, prerequisites, contact hours, texts and references, assignments, and tests. Accordingly, the J.S.S. syllabi of a specific program was reformatted in accordance with the ABET suggested outline so as to provide consistency of data presentation. A detailed compilation and sorting of syllabi and texts of group of courses followed and matched against a set of Wilkes syllabi. The resulting group matching documentation was then provided to the Wilkes faculty of the respective program for review, modification, and approval. It should be pointed out that as a result of this process the collective credits transferred from J.S.S. matched a lower equivalent Wilkes credits. The final step in the equivalency process is to identify for each transferring student the Wilkes course/lab needed to satisfy the Wilkes graduation requirements of a given program.

#### IV. Grade Assessment

Fundamental to the course/program equivalency is the proper understanding of the grading system. The J.S.S. system of grading, as in many other countries, is based on a variation of the percentage scale of 0 -100 points. On the other hand, the Wilkes grading system, as in many US universities, is based on a variation of the 0-4 scale including half points. The minimum-passing grade in the New Delhi campus, for example, is fifty percent (50%) or higher. A 2<sup>nd</sup> Class passing grade is defined to be 50%-59%, 1<sup>st</sup> Class passing is 60%-74%, and the 1<sup>st</sup> Class passing with Distinction (Honors) is a grade of 75% and higher. However, the grading schemes of the Maysore and Bangalor campuses are different.

It is important to note that reviewing the grade profiles of the engineering programs at the J.S.S. campuses showed them to be on the conservative side.

It is known that conversion scheme from Indian institutions to US institution has been available and has been used by various US institutions for quite some time. However, it was felt that a generalized grade equivalency would not satisfactorily address the quality control requirement of the project. As was pointed out that even within the same educational system differences in the grading process does exist. What is needed was a customized conversion table based on grading guidelines and practice history of every campus. The latter is deduced from the grade distribution pattern of course grades for each program.

Accordingly, a non-linear grade conversion tables were developed based on the forth-mentioned criteria. One such conversion table is given below in Table-1. Similar tables were developed for the other two J.S.S. campuses in Bangalor and Maysore.

Table-1 Grade Conversion for the New Delhi Campus.

J.S.S.	0-39	40-44	45-49	50-59	60-69	70-79	80-89	90-100
WILKES	0	1.0	1.5	2.0	2.5	3.0	3.5	4.0

## V. Quality Assurance (The ABET Factor)

The assurance of program quality of delivery and content is of primary importance for the transfer program. It is a major issue that has to be addressed since close scrutiny and interaction is complicated by vast distances. The importance of this issue is further increased by the fact that US engineering programs adhere in principle to ABET guidelines, requirements and accreditation. Consequently, quality assurance is exercised at different levels and through various avenues.

The first level of quality assurance is the student performance during the first three years at J.S.S. Accordingly; every student eligible for transfer must accumulate an overall 3-years minimum overall grade point average of 2.75 on a 4.0 scale (1<sup>st</sup> Class). Each individual course/lab grade considered for transfer must have a minimum grade of 2.5 on a 4.0 scale (1<sup>st</sup> Class). These conditions exceed those required by Wilkes from transferring students from US institutions. In addition, two recommendation letters attesting to the applicant's communication skills, academic performance, and character; a two page essay by the candidate stating his/her goals and objectives after graduation; and a comprehensive Assessment Letter from the respective J.S.S. Director (Dean).

While the instruction at J.S.S. is in English, a minimum TOEFL paper score requirement for the undergraduate students is 500 (173 computer-based score), and for the graduate students is 550 (213 computer-based score). In certain cases, Wilkes may accept alternative documentation demonstrating exceptional ability and proficiency in the use of the English language. ACT or SAT results are not required, but they are highly recommended.

Faculty profiles were also prepared in accordance to ABET guidelines and reviewed. Furthermore, a course/lab portfolio of exams and tests were compiled. This data will be monitored and updated annually.

Program assessment and performance at J.S.S. is defined and administered through the university system of India. Nevertheless, J.S.S. has started to adapt, with assistance from Wilkes, additional assessment and evaluation tools such as alumni and employer surveys, student evaluations, portfolios, and C.A.M. -- the Curriculum Attribute Matrix<sup>3</sup>. The latter is a pseudo-quantitative tool that highlights the collective contributions of existing courses/labs to the expected attributes (outcomes) of a specific program. These attributes follow in principle those articulated by the ABET EC-2000. The intent of this tool is to simplify the assessment of individual courses and measure their collective contribution to the curriculum as a whole. The faculty, through appropriate syllabi changes rather than major curriculum overhaul, can monitor and affect the necessary adjustments to achieve the intended programmatic goals.

Periodical visits to J.S.S. by the P/I and members of the faculty are intended to assure not only the continued programmatic and instructional level of excellence but also adherence to the objectives articulated in the course syllabi and program support documentation. Similarly, visits by the Directors of J.S.S. to Wilkes is to assure the continued understanding of the engineering programs, the nurturing of collaborative scholarship and the enhancement of the social environment for the students.

It should be pointed out that the final decision on acceptance into the program and credit transfer remains to be a decision of the appropriate Wilkes department and its faculty.

## VI. The Educational Environment

A 3-1 type transfer program where transferring students have a narrow window for acclimation and adaptation requires attention to societal changes. Proper cultural awareness preparation outweighs the detailed and endless program/syllabi equivalency and quality controls associated with this massive project. The measures taken to minimize the transition drawbacks were considered carefully. The following points summarize the major steps taken in this regard:

- (1) The project is funded entirely and directly by the two institutions, and thus, assured the seriousness of their commitment and support to the project. Furthermore, this approach provides both universities with the flexibility of quickly enacting support systems and measures without undue constraints and bureaucratic delays are to be expected implicitly or explicitly from a third party.
- (2) On-campus student advising is conducted through three channels: the project P/I, the International Student Advisor, and the departmental academic advisor. Advising starts as soon as the student enrolls in the program at J.S.S. using seminars and lectures on a variety of related topics conducted by the P/I and designated J.S.S. personnel.
- (3) While the role of the P/I is central in easing the transition issues, it is no replacement for actual contact among the students themselves. This advance interaction was initiated by sending Wilkes students and two staff members to visit with and hosted by J.S.S. for ten days. Such early contacts should provide the opportunity to experience first-hand the life and culture of both societies.
- (4) Special course is developed for the J.S.S. students as a part of their Wilkes program. The course addresses many of the topics associated with the US society, politics, and culture augmented by visits to related sites. This team-taught course provides the student with the opportunity to interact with faculty outside their technical disciplines, and develop an understanding of the US society and culture.
- (5) The Wilkes residence halls are designed as an apartment-style living quarters. However, the J.S.S. students, while they may be grouped in individual apartments, the apartments will be distributed among various residence halls. It was felt that this arrangement while it encourages the J.S.S. students to interact with other students on campus, it provides them with the privacy needed for daily living including cooking their special meals. The student may opt to live off-campus by consulting a listing of appropriate housing provided by the Students Affairs Office.
- (6) While the location of Wilkes is in close proximity of religious centers and local Indian organizations and associations, that information is compiled and provided to the students.
- (7) The J.S.S. students are expected to arrive together one week prior to the start of the fall semester and will be met by a Wilkes representative at the airport. During that week, they will participate in an orientation program conducted by the Students Affairs Office.

## Conclusions

A year and half after the inception of the program J.S.S.-Wilkes Scholars program, approximately twenty students will be arriving this fall. The 3-1 transfer program is unique but it is a much demanding program in terms of time, content, and funding support. It is distinguished from other types of programs by its emphasis on assuring a seamless student transition from one educational environment to another. A characteristic that should not be underestimated by academe. It is a quantum jump between the demands and preparation of a 3-1 program half way across the globe and that of a traditional 2-2 program.

The 3-1 program requires attention to details and tracking coupled with a serious appreciation of cultural differences and styles of education. It can be concluded that the strategic planning for this type of an undertaking must consider addressing in detail four points: Course/Program Equivalency, Grade Assessment, Quality Control, and the Educational Environment.

Both institutions believe that the progress of the project is on target. We are optimistic of our preparations and plans. The foundation is firm, the commitments are made, and the institutions are well prepared. Nevertheless, there will always be the pressures of anticipation associated with any cooperative venture yet to be tested in full. After all, the success of an educational program can only be measured by the success of its students.

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