



Partnership for Space Science Education and Research (PaSSER)

University of Puerto Rico at Mayagüez

P.O. Box 9048 Mayagüez, PR 00681-9048

phone: 787.832.2825 fax: 787.832.2485

www.ece.uprm.edu/PASSER

reaching for the stars... with NASA!

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Executive Summary and Background

A team of faculty members from the Electrical and Computer Engineering Department (ECE) and from the Physics Department at the University of Puerto Rico – Mayagüez (UPRM), The Johns Hopkins University, the National Astronomy and Ionospheric Center Arecibo Observatory, and Glenn Research Center, comprise the Partnership for Space Science Education and Research (PaSSER). PaSSER is a collaborative program of space science education and research to increase awareness and interest among the K-12 student population, challenge undergraduates through a program of space science studies and enrichment experiences, and provide faculty an opportunity for enhancement and collaboration with other institutions.. Students completing the program will be issued a **Certificate in Space Science and Technology**.

The proposed project will feature the following components:

1. Outreach to K-12 Students coordinated with the UPRM Planetarium;
2. K-12 Teachers Enrichment through summer camp immersion in space science;
3. Course and module development for inclusion in the undergraduate experience;
4. Faculty and student enrichment by summer internships at The Johns Hopkins University, at the National Astronomy and Ionospheric Center Arecibo Observatory, and at UPRM itself. Collaboration with Glenn Research Center will be via Internet and by exchange of coop students.
5. Continuous assessment and institutionalization of the program.

Course and Module Development for Undergraduate Space Science Education

Ionospheric Physics: the Sun-Earth Interaction

Dr. José Rosado

Rosado will develop a sequence of courses to capture the interest of students, following the thought that “this class may be the last opportunity these students have to see this material”. The overriding concern is how to make this material interesting and inspire students to continue with future research without watering in down so much it is not useful.

Optical and Computational Astronomy: a Window into the Structure of the Universe

Dr. Mark Chang

The Department of Physics at UPRM has a small 16 inch telescope which is used for teaching small audiences. The telescope will be automated and connected to a camera to allow viewing by an audience instead of the very limited one at time viewing. Below the telescope is a semicircular room which at present is used as a storage area, but which will be used as a small computing area for computations as well as for development of materials for courses and the training of in-service K-12 teachers.

Space Communications and Materials: Support for the Exploration of Space

Dr. Rafael Rodriguez Solis

Space probes and scientific satellites often require communications with Earth, to download data to scientists and for telemetry purposes, and with other satellites, to maintain formation and to pass collected data for another satellite to download it to earth. Furthermore, microwave sensors onboard these satellites often take measurements at several frequencies to better observe different characteristics from a target.



Dissemination and Outreach to K-12 Students and In-Service Teachers

Dr. Luis M. Quiñones and Ms. Dolores Balzac

The Department of Physics at UPRM has small planetarium capable of seating sixty four persons. This planetarium is visited by over ten thousand (10,000) K-12 students and their teachers and guardians each year. To help coordinate with the different schools, the Commonwealth Department of Education has a full time person (Dolores Balzac) dedicated to this effort. The Physics Department has also an astronomical observatory with a 16 inch Cassegrain, mentioned previously, and two 8 inch Celestron Ultima telescopes. The observatory opens twice a month for the general public. These facilities present a perfect opportunity for the dissemination of space science information and for capturing the interest of young students. While waiting to enter the planetarium presentation, visitors will be able to learn the story of the FUSE Mission and to enjoy interactive displays from several kiosks strategically placed in the waiting area. Material from the FUSE site as well as pertinent material available from the Internet will be displayed on large liquid crystal displays.

Summer Faculty and Student Enrichment

A limited number of students will be selected each year to participate in these enrichment activities. Students will be selected on the basis of GPA, interviews with PaSSER faculty and personnel, and handwritten essays. The summer activity will normally last from six to ten weeks. All expenses will be paid by PaSSER, including travel, lodging, and a living allowance or stipend. Faculty participating in these programs will be asked to monitor and tutor the students at the site. However, faculty will be pursuing their own research interests or developing course work, so no direct teaching will be required from them. Enrichment programs are made possible by coordination with The Johns Hopkins University, the National Astronomy and Ionospheric Center Arecibo Observatory, and NASA Glenn Research Center.

Certificate in Space Science and Technology

PaSSER Fellows from participating departments at UPRM that complete an 18 credit-hour program of study in space-related science and technology, such as astronomy, space communications, pattern recognition, and image processing, will receive a Certificate in Space Science and Technology that may lead to further studies and scholarships. These credits can be obtained from 12 credit-hours in course work from the approved list and 6 credit hours in undergraduate research or summer internship. Physics students will not be given credit towards the Certificate for ASTR 4005. ECE students will not be given credit for the Certificate for INEL 4301. The approved course list is shown in the following table:

Course Description	Crs.	Course Description	Crs.
INEL 4301 Communications I	3	ASTR 4005 Astronomy I	3
		INEL 5315 Communications Theory II	3
ASTR 4006 Astronomy II	3	INEL 5XYZ Ionospheric Physics	3
ASTR 5005 Formation and Evolution of Galaxies	3	INEL 5995 Special Problems in Space Communications	3
INEL 5046 Pattern Recognition	3	INEL 5309 Digital Signal Processing	3
		INEL 5326 Comm. System Design: DSP	3
INEL 5327 Image Processing	3		
FISI 4999 Undergraduate Research	3	INEL 4998 Undergraduate Research	3
FISI 4996 Coop Practice (Internship)	3	INEL 4995 Engineering Practice (Internship)	3

Contact: Prof. Rafael Fernández Sein, Director, Partnership for Space Science Education and Research (PaSSER) University of Puerto Rico, P.O. Box 9042, Mayagüez, PR 00681-9042, Tel. 787-832-2825, Fax 787-832-2485 Email: rafael_f@ece.uprm.edu