



PROYECTO
LUZ VERDE



IEEE Power & Energy Society

Women
in Power



WESTERN PUERTO RICO SECTION

1st IEEE PES UPRM-WPR Symposium

Power and Energy for Transformation

Mayagüez, Puerto Rico
October 12 & 13 , 2023

Welcome to El Colegio!



Javier Moscoso Cabrera,
Symposium Chair
IEEE PES UPRM
Student Advisor
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It is a pleasure to welcome you all to our First Symposium at the University of Puerto Rico at Mayagüez! For decades, our University has cultivated the minds of future engineers. The Power Systems and Power Electronics faculty have made it their mission to educate the best possible agents of change to solve the future's challenges with the program celebrating its 95th anniversary in 2023. As ambitious as my fellow classmates are, there is still a need to broaden our horizons and improve our capabilities by understanding the complex interconnections of our field and its implications in society. What better way to achieve this than joining leaders of all aspects of the energy practice in conversations? It fills me with pride to see the time has finally arrived! Today in Puerto Rico, the energy conversation means going beyond the technical aspects and considering the impact on communities, environment, and all key players. With this opportunity, we expect to highlight different perspectives. As students and the future generation, I believe we have the responsibility of getting involved in the relevant issues of today in order to be prepared to take on the agenda of tomorrow. Participating in this event is the best opportunity to be part of the conversation regarding the changes we want to see in the future and how to join efforts in collaboration to achieve the transformation we all want to see. We hope you enjoy your time here and thank you for believing in us to help be the voice of tomorrow!

Welcome to the IEEE Power and Energy Society - UPRM Student Branch Chapter!

On behalf of the IEEE PES UPRM Student Board, I'd like to thank you for your interest and participation in our symposium. This symposium holds immense significance in addressing critical power engineering topics, and it's particularly relevant to Puerto Rico given our history of the electrical grid. Due to several factors and situations, it is no secret that our electrical grid has faced many challenges, which is why I'm so passionate about the importance of education on this topic as we move toward modernizing our grid. Through activities of such nature, we aim to unite an audience of individuals well-versed on the innovations, technologies, and endeavors within the power field. As a student association looking to promote interest in the field, our main mission at IEEE PES UPRM is to prepare our members for their future by offering several technical and professional skill development opportunities, such as our student-led projects, leadership roles, workshops, and contact network creation. Recognizing the importance of the topic, we students and volunteers have worked tirelessly to bring this activity to life and hope it is an enjoyable and memorable experience for all visitors. Welcome, once again, to the 1st IEEE PES UPRM WPR Symposium. Let's unite in our passion for power engineering and work toward a brighter, more resilient future!



José Moll Rivera,
IEEE PES UPRM
President
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PROYECTO LUZ VERDE



Proyecto Luz Verde UPRM is an student-driven initiative consisting of three main pillars: energy consumption awareness, renewable energy education, and the design of a solar photovoltaic (PV) system with energy storage to serve as a model and for the service of the university community. This initiative originated in October 2019, carried out by students concerned about Puerto Rico's complex energy scenario following the aftermath of Hurricane María. When the project began, barely any student from the team had any actual experience with coursework related to power engineering and solar systems, since most were second- and third-year students of a 5-year engineering program. What began as a concern led to curiosity to learn about solar PV systems, which then ultimately led the team to think about actual community needs to address. Issues identified were the deteriorating electrical infrastructure all over Puerto Rico as well as a campus need for studying spaces and an active learning environment on systems that can define the line between life and death when you most need it. Proyecto Luz Verde addresses this situation as an initiative because of the fact that a lot is generally said about solar PV systems but what is taught is very limited and it seeks to go beyond and actively serve as a learning and testing platform for students and faculty around campus.

EmpoWer is an undergraduate student research project from IEEE PES - Women in Power chapter in collaboration with IEEE Women in Engineering. The project EmpoWer is working towards the implementation of a filtration system that includes a solar heater for a rescued school in Culebra. This school serves and contributes to the community of people in Culebra, making it a community school. Our mission is to inspire more women in the power and energy industry by providing opportunities for growth in sustainable energy. The vision is to allow society a noticeable change in the community by implementing sustainable options of energy that decrease environmental hazards all in the hands of empowered women, who are being represented as influential contributors in the industry.



AeroPower is a student-led research project aiming to become the first UPRM team to compete in the DOE's Collegiate Wind Competition. The team aims to design, manufacture, and test a scale wind turbine for power generation. As part of the competition, the team also has to design and analyze the viability of a wind farm project taking into consideration logistics, economic viability, and impact on the environment, among other aspects. Additionally, the team also has to organize outreach events, coordinate professional development workshops, and network with industry professionals. Through these multidisciplinary efforts. Members are expected to grow and learn professionally about the renewable energy field contributing towards a greener future and more sustainable future

IEEE PES UPRM INITIATIVES



Edwin G. Delgado, MSEE
IEEE WPR Section
Professional Branch
Chair

Welcome to the West of Puerto Rico!

Thanks for joining and sharing your interest in Energy and Power Systems by participating in our 1st IEEE PES Power and Energy Symposium. This conference is being held as a joint effort of the IEEE Western Puerto Rico Section and the IEEE PES Chapter Professional and Student branches. Providing a prime opportunity to bring together professionals, academics, and students of different backgrounds and experiences. Our objective is to share ideas, views, projects, and innovations regarding power systems, renewable energy systems, sustainable energy sources, and power systems technology. Our IEEE organizational branches have brought forward all resources possible to this event so it marks the electrical energy generation and distribution local environment in a prosperous way. Assuring a new start in the innovation and development of solutions that will benefit our future. Make yourself comfortable during the event so we can develop solutions to our energy goals.

Welcome to the Caribbean!

We extend a cordial invitation to join us at this exciting conference on Energy Systems led by the IEEE Western Puerto Rico Section and the IEEE WPR PES Chapter, both the student branch of UPRM and its professional section, which will take place at the prestigious University of Puerto Rico at Mayagüez (UPRM). This event promises to be a unique opportunity to immerse yourself in the fascinating world of electrical engineering and power systems, where renowned experts will share their knowledge on the latest trends and developments in this crucial field. We hope to have your presence to enrich our discussions and collaborate in constructing a more efficient and sustainable future in the energy field.



Dr. Eduardo I. Ortiz Rivera,
IEEE WPR PES Chapter Chairman
IEEE UPRM's Student Branch Faculty Advisor

We look forward to seeing you at this meeting!



Ricardo Reyes Burgos,
IEEE UPRM Student Branch
President

Welcome to the vibrant and sun-kissed shores of Puerto Rico!

It is with immense pleasure and excitement that I extend a warm invitation to Puerto Rico and to the Energy Systems Conference made by the Power and Energy Society of both the UPRM student chapter and the Western Puerto Rico Section. In the spirit of innovation to celebrate the power of knowledge, creativity, and collaboration renowned experts will share their knowledge in the bleeding edge topics that will shape the future of humanity in these topics. We would love to have your presence at this event to further enhance the conversation and discussion with your ideas.

We eagerly anticipate your presence!



Machine Learning Techniques for Malware Family Classification

Students of the IEEE Computer Society are developing different machine-learning techniques for the malware family classification problem. This project is sponsored by BAE Systems with the mission to expose students to cybersecurity, data analysis, and machine learning/deep learning. This is achieved by educating on the creation and curation of MOTIF (Malware Open-Source Threat Intelligence Family (MOTIF) dataset) to develop a base knowledge of the concept and better identify distinctions of certain Malware, capabilities, and effects. Then by applying different machine learning/deep learning techniques, certain techniques can be developed for efficient and innovative classification and detention problems



BioX Symposium on Engineering in Medicine and Biology

The Third Annual BioX Symposium is an IEEE Engineering in Medicine and Biology UPRM (IEEE EMBS) event that showcases research conducted at the undergraduate and graduate level at the University of Puerto Rico at Mayagüez during Spring 2024. This dynamic forum highlights the fields of bioengineering and biomedical engineering and attendees will have the opportunity to explore research areas, from medical devices to stem cell engineering; encouraging networking and scientific communication at our campus. Stay tuned for registration and abstract submission details to be part of this inspiring community of researchers and visionaries ready for #TheNextStepinHumanScience.



University of Puerto Rico at Mayagüez
IEEE Student Branch



IEEE UPRM INITIATIVES

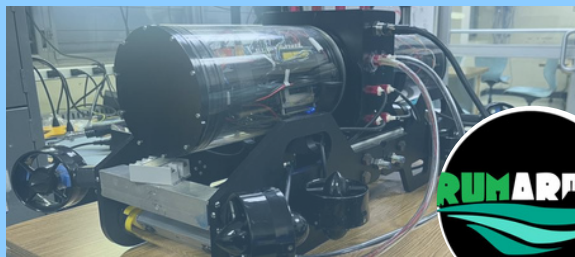
CAS HDL & FPGA Boot Camp

IEEE Circuits and Systems Society, Center of Advance Radio Science and Engineering, and L3harris developed an intensive boot camp, led by Prof. M. Jiménez. The objective of this event was to engage students in the theory and practice of various electronic and programming topics. Participants acquired knowledge of Field Programmable Gate Arrays (FPGAs) and Hardware Description Languages (HDL). Afterward, they had hands-on experience in learning to program in an HDL, recognizing its benefits and its determinants. Furthermore, they were to synthesize their HDL code and apply it to their FPGAs. This boot camp was finalized with a design challenge where they had to use a Xilinx Basys 3 FPGA and program using VHDL



RUMarino Autonomous Underwater Vehicle

RUMarino is a student organization within the IEEE & RAS that shares a mission to aid students in exploring and learning about subjects that arise in the industry, yet to be covered in university courses. Our team specializes in designing and innovating an Autonomous Underwater Vehicle (AUV) using topics within the Robotics field to compete in the annual RoboSub Competition. This has led RUMARINO to becoming the first Caribbean team to participate.



Agenda – Day 1: Thursday



8:30 AM Welcome



9:00 AM Keynote Session

9:30 AM Grid Forming Inverters

10:00 AM Native American & Puerto Rican Shared Energy Perspectives

10:30 AM Coffee Break

10:45 AM Panel: Women in the Energy Transformation

11:15 AM CHRES: UPRM & SANDIA: A Win-Win Experience



11:45 AM Lunch



1:15 PM SANDIA National Labs Puerto Rico Microgrids

1:45 PM Renewable Energy Algorithm Tool for Rural Electrification & Appropriate Technology (REAL-TREAT)

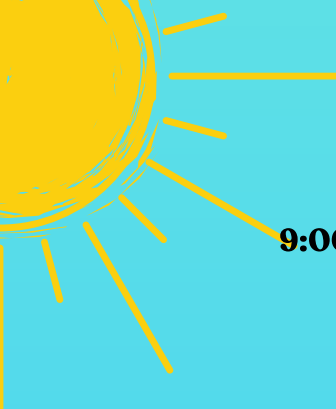
2:15 PM Coffee Break

2:30 PM NREL Mobility Futures

3:00 PM Proyecto Luz Verde UPRM

3:30 PM Panel: UPRM Perspectives on PR 100 Study





Agenda - Day 2: Friday

8:30 AM Keynote Session

9:00 AM Social Perspective an Energy Transformation

9:30 AM Transactive Energy Blockchain

10:00 AM Cybersecurity in Energy Systems

10:30 AM Coffee Break

10:45 AM Panel: Transportation Electrification Efforts in Puerto Rico

11:15 AM CHRES: UPRM Power Systems Portfolio

11:45 AM Lunch

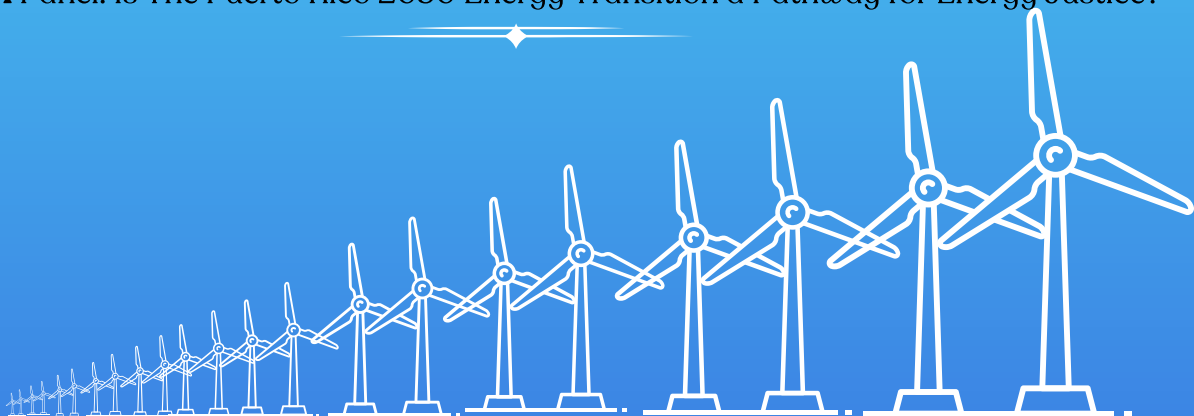
1:15 PM Panel: Community Participation in Energy Transformation

1:45 PM Cooperative Energy

2:15 PM Coffee Break

2:30 PM Environmental Defense Fund Efforts in Puerto Rico & the Caribbean

3:00 PM Panel: Is The Puerto Rico 2050 Energy Transition a Pathway for Energy Justice?





NSF CRISP Type 2: Interdependent Electric and Cloud Services for Sustainable, Reliable, and Open Smart Grids.

Smart grids are mechanisms to modernize energy grids and balance the current power structures in electric markets. The team from UPRM led by co-principal investigators Efrain O'Neill-Carrillo and Fabio Andrade is studying smart grids and the interdependency between the energy grid and the IT infrastructure that manages it. Microgrids and renewable energy systems are important components in this framework, they enable the modularization of the grid into autonomous/semi-autonomous and cloud services, whose interactions assist management. Many electric services will be accessible to users as REST-based cloud services, enabling the development of algorithms for users to subscribe to these services, collect operational data, and support analytics to predict electric energy demands. Current developments include mapping reliable power microgrids so electric services can be rapidly brought online to compensate for lost generation capacity or to obtain more affordable energy.



Microgrid Lab at CID,
Photographer Unknown

RII Track-2 FEC: STORM: Data-Driven Approaches for Secure Electric Grids in Communities Disproportionately Impacted by Climate Change

This project studies the opportunities to help communities impacted by climate change and the convergent and co-production of knowledge with communities, in collaboration with an interdisciplinary team. It is carried out by Adriana Luna, Agustín Irizarry and more. This is done with the objective to advance smart grid technologies. Engaging underserved communities in local climate change solutions and knowledge translation for microgrid design can result in a resilient microgrid plan produced by an interdisciplinary team of researchers and community members. This is followed by developing big data modeling, estimation, and secure control frameworks that can improve post-disaster power grid resilience. Resulting in an increase of situational awareness and mitigating the impact on the electric grid according to the community resilience goals. This involves the new multi-microgrid system restoration strategy that will prioritize critical loads at the community and individual levels based on a new multi-timescale predictive control and estimation framework that utilizes GFM inverters to provide optimal dynamic support during the process. Novel hardware Trojan prevention, detection, and mitigation techniques will advance the cyber-attack resilience of the entire system.

Minds2Create Research Team:

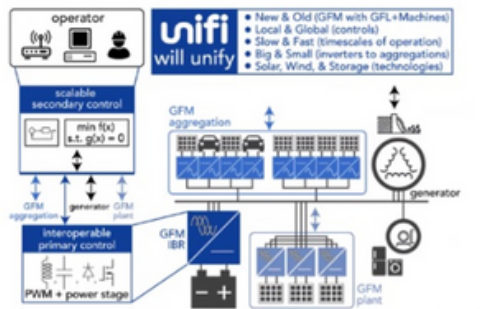
Minds2CREATE Research Team is a research group in the Department of Electrical Engineering and Computers (ECE) at the University of Puerto Rico-Mayagüez Campus and it is led by Dr. Eduardo I. Ortiz-Rivera. Part of Minds2Create Research Team initiatives is to participate on U.S. DoE/NREL Solar District Cup Competition since 2020, being division winners (1st and 3rd place) in consecutive years. Currently competing in Solar District Cup 2023-2024 with the objective to develop, design and model optimized solar PV distributed energy system for University of Texas at Dallas. The competition engages students in the engineering and design, outreach, finance, project development, urban planning, and related disciplines to reimagine how energy is generated, managed, and distributed in the district.

Oasis de Luz 2.0

The Puerto Rico Resilience Hubs Project will equip community-serving facilities with distributed energy and storage resources to provide seven of Puerto Rico's most vulnerable communities with access to electricity during, before, or after an extreme weather event or other grid-related disasters. The effort, led by IREC, also incorporates a workforce development component, where a graduate student and five undergrad students from UPRM engineering school will work directly with communities on the design and implementation of each resilience hub. IREC and UPRM will partner with Puerto Rico based entities to deploy small-scale solar photovoltaic and battery energy storage systems. The "centros comunitarios" are central to long-term community engagement for energy justice and resilience. The outcomes include an action plan that describes how to replicate this Project for other disadvantaged communities throughout Puerto Rico. The UPRM team is led by Marcel Castro-Sitiriche and includes Lionel Orama, Fabio Andrade, Agustín Irizarry from the ECE Department, Eduardo Lugo from the Psychology Department, and the CoHemis personnel.

Veguita Zamas, Jayuya, Mayo, 2018. Photo: Marcel

UNIFI: Universal Interoperability for Grid-Forming Inverters



UNIFI's R&V agenda seeks to outline frameworks for interoperable primary control and secondary control in a manner that unifies: new & old technologies, local & global controls, slow & fast timescales of operation, for IBRs of different types, technologies, and ratings.

UNIFI will sponsor 15 UPRM students and faculty to be trained in the areas of grid-forming inverters and hybrid energy systems. The UPRM's PI is Dr. Eduardo I. Ortiz-Rivera and the research work will be done at the Smart Power Electronics and Aerospace Research Laboratory (SPEAR) at S222E.

The Castañer Microgrid

Microgrids are an essential part of this renewable energy transition. The main reason for this is that they add resilience for the communities when the electric grid fails, since solar and energy storage take over. During emergencies, the five local businesses connected to the microgrid become energy resilience centers. Residents can access food storage, health services, and other security needs. This currently benefits not only the community but also local businesses, organizations, and solar companies that partner with national groups like IREC. The collaboration between IREC, the Cooperativa Hidroeléctrica de Montaña, the University of Puerto Rico – Mayagüez, and the local installer company Borintek are what make projects like this a reality. More programs like the Puerto Rican Solar Business Accelerator, led by IREC and Pathstone Corp. and funded by the U.S. The Economic Development Administration (EDA) can assist in the continuous innovation of Microgrids. Castañer is currently one of two planned microgrids that IREC is developing with local partners in Puerto Rico. The second will be in the community of Maricao. Through previous initiatives, IREC has also worked with organizations such as the Hispanic Federation, the Clinton Foundation, and Direct Relief to support the installation of solar panels on federally qualified health centers in rural communities.

Photo Credit: Cooperativa Hidroeléctrica de la Montaña <https://www.eesi.org/articles/view/microgrids-in-puerto-rico-keep-rural-communities-connected>

UPRM POWER FACULTY AND THEIR AREAS OF EXPERTISE



Dr. Fabio Andrade Rengifo
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Microgrids, Renewable Energy Source, Power Electronics, Real-Time Simulation, Control of MGs.



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Power System Operation & Control, Optimization, Evolutionary Computation Techniques, Transmission & Distribution, Illumination, High Voltage, Electrical Safety.



Dr. Efraín O'Neill Carrillo
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Sustainability, renewable energy, distributed energy resources, microgrids, power quality, power distribution systems, energy resilience, energy policy, community engagement, service learning, social and ethical implications of engineering and technology.



Dr. Erick Aponte Bezares
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Distributed Generation (DG), DG dynamics, Corrective Control, Islanding detection and support, Alternative Energy.



Dr. Agustín Irizarry Rivera
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Power Systems Dynamics, Renewable Energy Resources Integration into the Power Grid.



Dr. Lionel Orama Exclusa
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Electrical discharges in vacuum and gases, vacuum switching technology, power systems transients and protection, alternative energy sources.



Dr. Marcel Castro Sitiriche
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Smart rural power systems, power electronics, renewable energy systems, appropriate technology, responsible wellbeing, engineering education, and computational intelligence.



Dra. Adriana Luna Hernández
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Monte Carlo methods, distributed power generation, electric vehicle charging, power system simulation, time series, Matlab, battery powered vehicles, control engineering computing, data acquisition, distribution.



Dr. Eduardo I. Ortiz Rivera
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Photovoltaic Systems, Mathematical Modeling of Renewable Energies, Optimization, Robotics, Power Electronics, Resonators, Nonlinear Control, Electric Drives, Cybersecurity Applications for Power Systems.

2023 IEEE PES UPRM WPR Symposium General Organization

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Dr. Erick Aponte

José Moll
Edwin Delgado
Ricardo Reyes

Dr. Eduardo Ortiz
Dr. Marcel Castro
Dr. Agustín Irizarry

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Thank you to our sponsors!
Without you this would not be possible.



NATIONAL RENEWABLE ENERGY LABORATORY



WESTERN PUERTO RICO SECTION



This event was possible thanks to the collaboration
of the following organizations. We thank you!



U.S. DEPARTMENT OF
ENERGY



unifi
universal interoperability
for grid-forming inverters



INTERSTATE RENEWABLE ENERGY COUNCIL



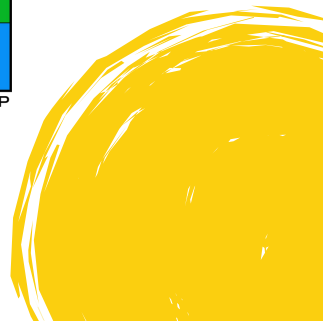
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ESTUDIO DE INGENIERÍA



ENLACE LATINO DE ACCIÓN CLIMÁTICA
PUERTO RICO

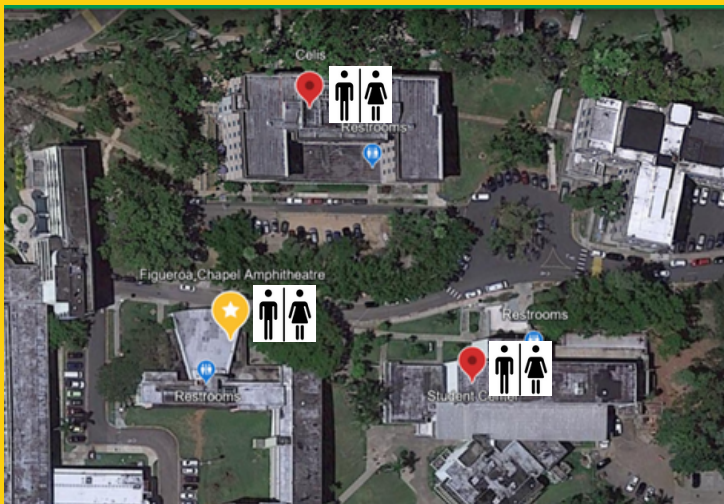
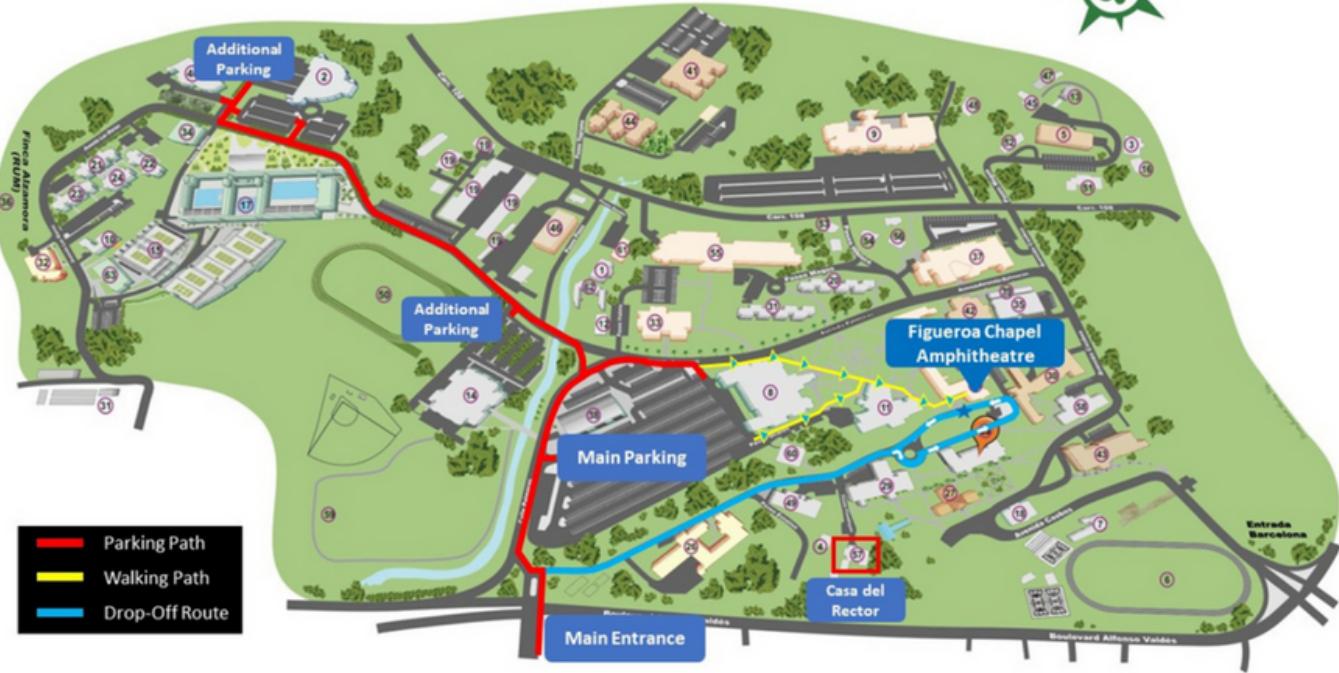


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Welcome to University of Puerto Rico at Mayagüez!

Drop-Off, Parking, and Walking Routes



Address : 6V55+WRF,
Universidad de Puerto Rico,
Mayagüez

Recommended Colegio

Experiences:

Casa EcoSolar
MUSA Art Museum
Alzamora Estate