Francisco Ros- Qualcomm Scholarship and Training Program on 5G Mobile Communications at ETSIT UPM

The Rogelio Segovia Foundation for the Development of Telecommunications (Fundetel) with the support of Prof. Ad-Honorem Francisco Ros and Qualcomm Inc. have launched the Francisco Ros – Qualcomm Scholarship and Training Program on Mobile Communications at the ETSIT-UPM (School of Telecommunications Engineering at the *Universidad Politécnica de Madrid*, Spain).

The training program has two lines of action:

1. An online training course on 5G mobile communications to facilitate complementary competencies to engineering students and life-long learning opportunities to professionals in the ICT sector.

2. A scholarship program to sponsor Bachelor's and Master's Theses, as well as Doctoral studies in the area of mobile communications for students at the ETSIT-UPM.

With this program, Fundetel contributes to its mission of assisting and sponsoring teaching, research, development, and innovation activities in the areas of science, technology, culture, and human knowledge, with special emphasis on the fields of information technology, telecommunications, and electronics.

The training program will take place over four years, between academic years 20/21 and 23/24, both included. The two lines of actions are described below.

1. Training Course on "*Strategic and Technical Visions of 5G Mobile Communications*"

The training course on the *Strategic and Technical Visions of 5G Mobile Communications* will be a 3 ECTS[1] course organized by Fundetel. The course will require students to attend 30hrs of online teaching and complete another 30hrs of student's work. The course will take place during April and May every academic year and will use the Blackboard Collaborate remote teaching tool from the *Universidad Politécnica de Madrid*.

The contents of the course will be divided into four units, namely: (i) context analysis (ii) technologies, (iii) enablers, and (iii) application to vertical sectors. A draft of the course syllabus is provided in Annex A. Each unit will include several topics and will be taught by faculty of the ETSIT-UPM and renowned professionals of the ICT sector.

The course will be open to students in their last year of any Bachelor's or Master's studies in a technology-related field of a qualifiable university, as well as to professionals of the ICT Sector. The general course fees will be 100 euros. This program scholarship recipients will not have to pay a fee.

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[1] The European Credit Transfer and Accumulation System is a tool of the European Higher Education Area to standardize learning outcomes and their associated workload.

2. Scholarship program

The scholarship program will have three types of scholarships for students at the ETSIT-UPM according to their academic degree (Bachelor, Master, or Ph.D.), namely:

A. *Francisco-Ros Qualcomm Scholarships for Bachelor Thesis*
B. *Francisco-Ros Qualcomm Scholarships for Master's Thesis*
C. *Francisco-Ros Qualcomm Research Initiation Scholarships for Ph.D. students*

The scholarships A and B aim to support students' Theses, as all students enrolled in official degrees at the ETSIT- UPM must undertake a Final Year Thesis (hereafter Thesis, i.e. BSc and MSc Theses) at the end of their studies. The objective of the Thesis is that students apply the knowledge acquired and the experiences accumulated during their university studies to solve real problems, develop new ideas, models, or prototypes, etc. It also aims to develop and improve other skills such as creativity, originality, and interpersonal abilities.

The third type of scholarship, the *Research Initiation Scholarship for Ph.D. students*, aims to facilitate graduates the access to Ph.D. studies, supporting them at the beginning of their research career.

The scholarship program will support up to 16 BSc Theses, 16 MSc Theses, and 8 Research initiation scholarships in mobile communications. Scholarships will last for six months and may be recognized in the student's curriculum. Students who benefit from the scholarships will complete their training by taking part in the course described above, whose academic fees will also be covered by the scholarship.

The rules for the Thesis scholarship call will be as follows:

- Candidates must be students of a BSc or MSc official degrees at the ETSIT-UPM.
- Candidates must propose a Thesis within the areas of mobile communications in a broad sense, including the areas of communications and systems, telematics, and electronics, as well as the application of sensorization, IoT, and wireless communications to the different industrial and service sectors.
- Candidates should have an assigned supervisor for the proposed Thesis, who must be a member of the faculty of the ETSIT-UPM. Occasionally, applications without an assigned supervisor may be considered.
- Candidates must commit to undertaking the course Francisco Ros-Qualcomm on 5G Mobile Communications.

The rules for the Research Initiation Scholarships call will be as follows:
- Candidates must be pre-enrolled in one of the Doctoral Programs at the ETSIT-UPM.
- Candidates must submit a six-month research proposal within the areas of mobile communications in a broad sense, including the areas of communications and systems, telematics, and electronics, as well as the application of sensorization, IoT, and wireless communications to the different industrial and service sectors.
- Candidates must have the endorsement of an ETSIT-UPM Professor to supervise the Ph.D. work.
- Candidates must commit to undertaking the course Francisco Ros-Qualcomm on 5G Mobile Communications.

Annex B details the draft call for the 20/21 academic year. The endowment of each scholarship will depend on the student's profile. The supervisor of the work will also receive an endowment for his/her tasks. The Scholarship endowments and the number of scholarships per type are detailed in Table 1.

Type of scholarship	Monthly gross endowment (Euros)	Duration (months)	# scholarship per call	Supervisor endowment (EUR)
A – BSc	400	6	4	400
B – MSc	600	6	4	400
C - PhD	700	6	2	400

Table 1. Endowments and number of scholarships per type.

Annex A. Detail of the Training Program Francisco Ros- Qualcomm on 5G Mobile Communications: *Strategic and Technical Vision of 5G Mobile Communications*

This four-week training program covers the main technical aspects of 5G technologies and their implications for the entire mobile ecosystem. Each unit will run for a week, with online teaching sessions that will last 1.5 hours from Monday to Friday.

As far as possible, we will intend that all units are taught by both academic faculty and renowned ICT professionals. This will allow combining academic content and professional views for a better educational experience. The guest talks from ICT professionals will include a 45 minutes' presentation and 45 minutes' Q&As from the students.

The contents of each unit are further detailed next.

UNIT 1. CONTEXT ANALYSIS (7.5 h)

This unit presents an overview of 5G mobile technologies across the entire ecosystem and presents what there is across the value chain, including devices, networks and applications. Additionally, the use cases of 5G are presented to discuss the demand for new connectivity services and the related market opportunities. Finally, future trends in mobile technologies are presented in their road to 6G.

Weekday	Topic	Duration
Monday	5G Overview: technology requirements	1,5h
Tuesday	Market Opportunities: use cases and demand	1,5h
Wednesday	Networks & Deployments	1,5h
Thursday	Devices & Applications: IoT, wearables, always connected PCs, etc.	1,5h
Friday	What's next in mobile technologies beyond 5G? The road to 6G	1,5h

UNIT 2: MOBILE TECHNOLOGIES (7.5h)

This unit describes the technical aspects of 5G mobile technologies in contrast to previous generations and other non-cellular alternatives and short range connectivity technologies. The main points of the 5G standards are described, as well as the spectrum and new frequency bands assigned to mobile services.

Weekday	Topic	Duration
Monday	Evolution of mobile networks: from 2G to 5G.	1,5h
Tuesday	The 5G Standards: Rel. 15/16/17	1,5h
Wednesday	Next-generation Radio Access Technologies: NB-IoT, 5G NR, mmW, beamforming, MU-MIMO	1,5h
Thursday	Spectrum assignments & new frequency bands	1,5h
Friday	Sensors and Connectivity; WiFi 6 and other short range technologies	1,5h

UNIT 3. 5G NETWORK AND SERVICE ENABLERS (7.5h)

This unit covers how 5G networks leverage technology enablers such as network virtualization, big data and machine learning, smart devices and cybersecurity developments. Additionally, the concept of OpenRAN is introduced and analyzed.

Weekday	Topic	Duration
Monday	Virtualization: NaaS & network slicing	1,5h
Tuesday	Big Data and machine learning in 5G: distributed computing.	1,5h
Wednesday	Intelligent device technologies	1,5h
Thursday	Cibersecurity	1,5h
Friday	OpenRAN	1,5h

UNIT 4. APPLICATIONS AND SERVICES. (7.5h)

This unit illustrates a set of applications and services that are being delivered with 5G technologies for different vertical sectors. Each session will present a real proof of concept in the field of extended reality, healthcare, automotive, industrial and commercial sectors, and smart cities and smart agriculture.

Weekday	Topic	Duration
Monday	Extended Reality (AR/VR)	1,5h
Tuesday	Healthcare	1,5h
Wednesday	Automotive	1,5h
Thursday	Industrial & Commercial	1,5h
Friday	Smart Cities & Smart agriculture	1,5h

Annex B. Scholarship Call for the academic year 2020/2021

The Francisco Ros-Qualcomm Program on 5G Mobile Communications opens a call for 10 scholarships to undertake Thesis and Research Initiation Scholarships for the academic year 2020-2021 in areas of mobile communications, including the fields of communications and systems, telematics, and electronics, as well as the application of sensorization, IoT, and wireless communications to the different industrial and service sectors.

Candidates' requirements

The call includes three types of scholarships. Students who meet the following requirements may apply:

A. Francisco-Ros Qualcomm Scholarships for Bachelor Thesis

Candidates must:
- be enrolled in an official undergraduate program at ETSIT UPM.
- fulfill the academic requirements to defend the BSc Thesis within the 2020/2021 academic year.
- have a BSc Thesis proposal endorsed by a Professor at ETSIT-UPM who will act as the supervisor.
- commit to the Francisco Ros-Qualcomm Program's training course on 5G mobile communications.

B. Francisco-Ros Qualcomm Scholarships for Master's Thesis

Candidates must:
- be enrolled in an official Master's program at ETSIT UPM.
- fulfill the academic requirements to defend the MSc Thesis within the 2020/2021 academic year.
- have an MSc Thesis proposal endorsed by a Professor at ETSIT-UPM who will act as the supervisor.
- commit to the Francisco Ros-Qualcomm Program's training course on 5G mobile communications.

C. Francisco-Ros Qualcomm Research Initiation Scholarships for Ph.D. students

Candidates must:
- be pre-enrolled to one of the ETSIT-UPM Doctoral Programs.
- submit a six-month research project.
- have the endorsement of a Professor of the ETSIT-UPM to enroll in a Ph.D. program.
- commit to the Francisco Ros-Qualcomm Program's training course on 5G mobile communications.

Distribution and endowment of scholarships

The ten scholarships are distributed in four scholarships for undergraduate students, four for master's students, and two for Ph.D. students. All scholarships will last for 6 months, from February to July (both inclusive) of the year of the call. Gross endowments will depend

on the student's profile and are detailed in Table 2. The tutor will receive a unique endowment of 400 euros for the supervision of the work.

Type of scholarship	Monthly gross endowment (Euros)	Duration (months)	# scholarship per call	Supervisor endowment (EUR)
A – BSc	400	6	4	400
B – MSc	600	6	4	400
C - PhD	700	6	2	400

Table 2. Endowments and number of scholarships per type.

Obligations of the beneficiaries

With the acceptance of scholarships, beneficiaries assume the following obligations:
- Perform the Thesis (or research proposal) with which they have applied for the scholarship and defend it before July 2021.
- Successfully take part in the course Francisco Ros-Qualcomm on 5G mobile communications that will take place in spring 2021.
- Commit to a 20-hour/week dedication during the duration of the scholarship. The scholarship is generally incompatible with any other scholarship or paid work. Nonetheless, the beneficiary may apply for compatibility if, in the beneficiary's opinion, there are special reasons to be set out in the application.

If at the end of the academic year (July 2021), the student has not fulfilled some of the above obligations, the organization reserves the right to ask for a refund of the endowments received.

Application procedure

The student must send the following documentation, via the web application form, at www.programa5Gfranciscoros.etsit.upm.es:
- Curriculum Vitae with contact information.
- Academic record obtained in his/her BSc and MSc degrees.
- Cover letter presenting the Thesis or research concerning the areas of mobile communications, and the research activity of the tutor concerning the subject matter of the scholarship.

The application will be open until January 20, 2021.

Selection procedure

Nominations will be evaluated by the committee consisting of the members of the Francisco Ros – Qualcomm Training Program Monitoring Commission and will be published on January 25, 2021.

The main assessment criterion will be the academic record, supplemented by the cover letter and the CV. Any merits of the curriculum related to the subject of the scholarship, as well as soft skills will be valued.

To support equal opportunities in access to higher education, the Commission will assess applications from candidates by gender, disability, and family background. The applicant

shall reflect this on his CV and provide as much evidence as he deems appropriate for the Commission to assess.