

## M.Sc. Program Chair:

Assoc. Prof. Dr. Plamen I. Dankov, ☎ +35928161806  
[dankov@phys.uni-sofia.bg](mailto:dankov@phys.uni-sofia.bg); <http://wireless.phys.uni-sofia.bg>

## Lecturers:

Assoc. Prof. P. Dankov, Assoc. Prof. R. Atanasov, Assoc. Prof. N. Djermanova, Assoc. Prof. J. Kiss'ovski, Assoc. Prof. E. Vladkov, Assoc. Prof. R. Bezduzhni, Assoc. Prof. M. Burova, Dr. D. Yankov, Dr. N. Neshev, Dr. L. Stoev, Dr. M. Gatchev, Dr. L. Urshev, Dr. N. Tabal'ov, Assist. Prof. S. Kolev, Asist. Prof. N. Zografov, etc.

## The most important information for the M.Sc. Program:

1. The program has two forms of training – regular and extramural. They both offer equal number of courses (the lectures for the extramural form are reduced with one hour) and equal number of ECTS credits allocated. The regular program with duration 3 terms (90 ECTS credits) starts in October with first winter term, while the extramural program with duration 4 terms (also 90 ECTS credits) starts in March. The *foreign students* apply for the *regular training only* by application forms without any additional entrance examinations. They pay the standard taxes, accepted in the Sofia University.

2. The program consists of 7 mandatory, 18 eligible and 2 optional courses. They all cover quite wide areas of the modern wireless communications: standards, protocols, hardware, software and applications, design, measurements, antennas, security, practical exercises in networks, network management, innovations, etc.

3. The training groups are organized in such a way, that the students have lectures predominantly evening for the both forms of the program. The courses are grouping in 3 cycles (2-3 courses in a cycle) at intervals of 5 weeks. The exam of each course is carried out immediately after the lectures. Two small vacations: in the beginning of December and before Easter (April/May) are possible.

4. The students should choose an educational practice "Wireless networks and devices" in the 3<sup>rd</sup> term with duration 15 weeks (15 ECTS credits). It is carried out in scientific laboratories, institutes, companies, high schools, etc. The master thesis can be prepared during the practice. An alternative of the practice is the individual preparation of the master thesis. They both should be reported in a written form and it will be evaluated by two lecturers from the program. The master training finishes with M.Sc. thesis (15 ECTS credits) in January or in July. The obtained diploma is worldwide recognized. The Erasmus students apply for this M.Sc. program in their Universities, which have Erasmus letter of agreement with Sofia University.



TV-town "Konitoto"



Ray Sat BG



Space Earth center in Plana village



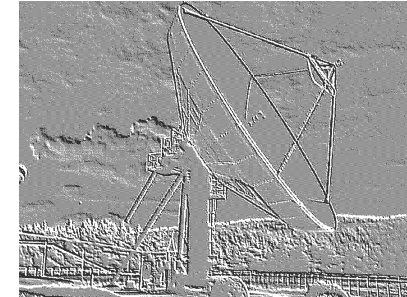
Faculty of Physics



Sofia University "St. Kliment Ohridski"

Faculty of Physics

Department of Radio-Physics and Electronics



## Master Educational Program:

### *Wireless Networks and Devices (WND)*

Professional directions:

*Physics*

Educational level:

*Masters of Science*

Specialty:

*Engineer Physics*

Training duration:

*3 semesters (regular form)*

Form of training:

*Regular forms*

Professional Qualification:

*Master in Engineer Physics –  
Wireless Networks and Devices*

<http://www.phys.uni-sofia.bg/~dankov/Master%20program%20BMU/>



## Master Program "Wireless Networks and Devices"

Training duration: 3 (1.5 years)

Form of training: regular

The microwave range is the most intensively developing part of the EM spectrum used in the modern wireless communications. The main advantages of microwave frequencies can be listed as follows: *i)* more communication channels, providing bigger data transfer rate and supporting huge variety of communication services can be arranged easily at higher frequencies; *ii)* antennas used at microwave range are relatively small, but in the same time they can ensure high directivity needed for radars and navigation applications; *iii)* microwaves propagating through the earth ionosphere can provide communications using different types of satellites, communications supporting space scientific missions, radio astronomy, etc.; *iv)* the interaction of the microwaves with biological tissues can be used in therapeutic medicine, image sensing and in other industrial and scientific applications; *v)* the modern communication technologies in RF and microwave bands (OFDM, MIMO, AMC, AAS, ...) allow extremely effective usage of the spectrum, *vi)* the RF and microwave clock signals are widely used in the state of the art digital processors, transferring in that way the modern computer into a microwave device. The intensive growing of the modern communications and microwave technology is everywhere connected with big demand of engineers with suitable qualification. The microwave engineers and physicists are in the top 3 most demanded specialists in many countries. Unfortunately, the number of RF engineers is much less that practically needed for research institutions and industry. First of all, the education of the microwave engineers is relatively difficult; because they have to combine specific knowledge in different disciplines such as electronics, microwave and RF circuits, electrodynamics, EM-wave propagation, specific RF measurements, numerical simulations, communication system analysis, etc. In addition, the equipment needed for practical training is very specific and relatively expensive. Nevertheless, the professional realization of the well-qualified RF engineers is undoubtedly reliable.

The M.Sc. program „Wireless Network and Devices” is established for education of qualified specialists with sound knowledge in the area of microwave engineering, applied physics and modern communication technologies. The program has a wide enough, but well-balanced profile, including three interconnected axes: 1) networks, software, channels; 2) devices, systems, signals and 3) networks and innovation management. The M.Sc. program has achieved continuous growth over the last 8 years. Its attractiveness to high-scoring students has been significantly enhanced by convincing incorporation of training on the basics of personal and team management towards systematic search for, design and introduction of innovations. Corresponding studies include methods for overcoming inertia of thinking as well as generation, analysis and selection of new ideas. Overall approaches to achievement of high internal motivation and effective interpersonal communication are provided in the context of innovation process.

The full period of education is 3 terms and 90 ECTS credits: 7 compulsory (35 credits), 5 elective courses (25 credits), one „problem-orientated” practice (15 credits) and finished with preparation of M.Sc. thesis (15 credits). The English is the official language of the program. The training team includes high-competent lecturers from different high schools and leading specialists and project managers from several communication companies in Bulgaria. The applicants for the M.Sc. program WND must have suitable bachelor degree in the area of Physics, Electronics or Communication Engineering, Computer science, Information technology, etc., and relatively good English. The education process starts every year in the beginning of October. The applicants should apply for the program before the end of September, when apply by documents only. The application forms are standard for the Sofia University „St. Kliment Ohridski”. The applicants by documents only must have minimal average mark from their bachelor education, equivalent of the European C-degree. The students officially finish the M.Sc. program, when defend the Master’s thesis in the presence of an official (government) commission. The received M.Sc. diploma from the Sofia University „St. Kliment Ohridski” is worldwide recognized. The graduated students of the M.Sc. program „Wireless Network and Devices” should have knowledge in the area of design and measurement of RF and microwave integrated circuits, antenna engineering, system design of wireless communication systems and the communication technologies. They may apply for jobs in companies and organizations connected with the design, manufacturing, measurements and analysis of microwave devices and systems, as well as in the area of modern wireless communications. ◆

## CURRICULUM

(FOR THE REGULAR FORM OF EDUCATION)

Courses	Hours/ECTS credits	
<b>I<sup>st</sup> semester (winter)</b>		
Introduction to wireless communications ( <i>initial selectable</i> )	60	5
Applied Electrodynamics for M.Sc. students ( <i>initial selectable</i> )	60	5
Modern physics for engineers ( <i>initial selectable</i> )	60	5
Modulation and coding in the digital communications ( <i>compulsory</i> )	75	6
Wireless networks and protocols ( <i>compulsory</i> )	60	4.5
Computer practice in communication systems ( <i>compulsory</i> )	45	4.5
Mobile radio-channels ( <i>selectable</i> )	60	5
Microwave measurement in communications ( <i>selectable</i> )	60	5
Fixed and Mobile satellite communication systems ( <i>selectable</i> )	60	5
Toolbox on MatLab for communication applications ( <i>selectable</i> )	60	5
Practical programming on Visual C++ ( <i>selectable</i> )	60	5
Management of the communication networks ( <i>selectable</i> )	60	5
<u>(Note: the students must choose 1 course from the initial selectable courses and 2 additional courses from the other selectable courses)</u>		(totally 30)
<b>II<sup>nd</sup> semester (summer)</b>		
Information and statistics in the wireless communications ( <i>compulsory</i> )	60	4.5
Microwave communication devices and systems ( <i>compulsory</i> )	75	6
Integrated circuits and devices for wireless networks ( <i>compulsory</i> )	60	4.5
Laboratory practice in Integrated circuits and devices for wireless networks ( <i>compulsory</i> )	45	4.5
Processors in wireless communications ( <i>selectable</i> )	60	5
Antennas for wireless communication systems ( <i>selectable</i> )	60	5
Security of the communication networks and systems ( <i>selectable</i> )	60	5
Operational systems and open-source applications in the communications (Lab. exercises) ( <i>selectable</i> )	45	5
Electromagnetic compatibility in communications ( <i>selectable</i> )	60	5
Optical communications and optical data processing ( <i>selectable</i> )	60	5
Radio-frequency identification devices (RFID's) ( <i>selectable</i> )	60	5
Management of the innovations ( <i>selectable</i> )	60	5
<u>(Note: the students must choose 2 courses from the elective courses)</u>		(totally 30)
<b>III<sup>rd</sup> semester (winter)</b>		
Educational practice ( <i>selectable</i> )	180	15
Individual preparation of the master thesis ( <i>instead of the practice</i> )	180	15
Master thesis ( <i>compulsory</i> )	180	15
		(totally 30)