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No.	Articles	Page
9.	Bacterial Cellulose Production from Gac Juice Karan Phromthep, Suwimon Katakul, Phinthida Na Thaisong, Tawanhatai Klaykan, Niphaporn Suksawat	65
10.	Broken-Milled Riceberry Drinking Yogurt Nomjit Suteebut, Chayapat Kee-ariyo, Katsarin Meetam, Munin Nuchngang, Nopporn Sakulyunyongsuk, Thanapop Soteyome	71
11.	Study the ability to tolerate salt and produce proteins based on microorganisms isolated from soy sauce residue Thanapop Soteyome, Chayapat Kee-ariyo, Nomjit Suteebut, Nopporn Sakulyunyongsuk	81
Path II : Innovative Technology and Sustainability Engineering		
12.	Development of the Experimental Set for Measuring the Speed of Sound Sirin Sirathanakul	91
13.	Aerosolization of Hydroxyl Radicals as a Safe Alternative Disinfection for Bacterial Reduction Adjima Chayasitthisophon, Kenneth W. Foster, Nopphon Weeranoppanant, Aluck Thipayarat	96
14.	Evaluated Investment Projects using ERP (Enterprise Resource Planning): A Case Study of Industrial Plants By Real Option Kunyaluk Nuchprayoon, Chayathach Phuaksaman	104
15.	Dynamic Multi-product Multi-level Capacitated Lot Sizing Using Heuristic Method Songwut Prakaiwichien, Vichai Rungreunganun	108
16.	Properties of Rice Grain after Mild Heat Treatment by Radio Frequency Heating for Killing Insects Pisith Sok, Sirichai Songsermpong	117
17.	Development of Multimedia Package on Microstrip Antenna for Learning in Telecommunication Engineering Pisit Sonla, Anucha Chaichan, Pawana Choosiri, Wannapa Manosueb	126
18.	Teaching Electric Circuit Laboratory with Arduino-Based Activity Preecha Sakarung	130
19.	Excitation Energy Transfer in Light-Harvesting Complex II Detection Probe Model Using Micro-optical Device Sarayut Pantian, Napalai Seesod	136
20.	The Comparison of the Alternative Fuel Properties at Low Temperatures Somjai Peanprasit, Nataporn Chindaprasert, Chonlakarn Wongkhorsub, Padet Sankasem, Padipan Tinprabath	142

Development of Multimedia Package on Microstrip Antenna for Learning in Telecommunication Engineering

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Keywords: Multimedia Package, Microstrip Antenna, Telecommunication Engineering

Abstract. The objective of the research was to develop and find an efficacy of multimedia package on microstrip antenna for learning in telecommunication engineering. The research tools consisted of of the content sheets, experimental set, PPT presentation and tests. The tools were firstly observed by 3 experts and evaluated by 15 student sample group who registered in microwave subject in industrial education program of Rajamangala University of Technology Phra Nakhon. The research results showed that 1) the multimedia package on microstrip antenna had an efficiency of 80.44/80.00 which was higher than the standard of 80/80 according to the hypothesis and 2) after learning, students' satisfactions were in a high level ($\bar{X} = 3.93, S.D. = 0.84$). In conclusion, the multimedia package on microstrip antenna can be used effectively for learning and teaching in telecommunication engineering.

Introduction

The education research and development of modern microwave circuits are much stronger within the microwave engineering [1]. However, teaching and learning for content of telecommunication engineering focus to calculate, to analysis and to design the microwave circuits such as microstrip line, filters, waveguide circuits and planar circuits. It is the basis of microstrip antenna. Thus, students should have knowledge of the calculation, analysis and design. It can apply their knowledge to design and construct microstrip antennas. Now, computer technology and communication have been developed very progressively and have been integrated into educational technology and encourage students to have more knowledge and skills.

After the surveying by using interview of teaching and learning conditions of microwave engineering found that microwave subject was the most essential and important subject with content have content is difficult to understand. The most instruction media have not several, have not enough for the students and uncomfortable by used.

In this paper we present the development of multimedia package on microstrip antenna for learning in telecommunication engineering. Multimedia package have been used to augment and supplant computers in classrooms because they are readily available, inexpensive and easy for educators to use. Multimedia package were effective classroom organizational tools for educators. Student can used an education tool for learning with this developed multimedia package.

Microstrip Patch Antenna

Microstrip antenna technology began its rapid development in the late 1970s. By the early 1980s basic microstrip antenna elements and arrays were fairly well establish in term of design and modeling [2]. In the last decades printed antennas have been largely studied due to their advantages over other radiating systems, which include: light weightiness', reduced size, low cost, conformability and the ease of integration with active devices [3]. From fig 1. microstrip patch antenna consists of a radiating patch on one side of a dielectric substrate and a ground plane on the other side. The patch is generally made of conducting material such as copper or gold and can take

any possible shape. The radiating patch and the feed lines are usually photo etched on the dielectric substrate. Microstrip patch antennas radiate primarily because of the fringing fields between the patch edge and the ground plane. It can be fed by a variety of methods [4].

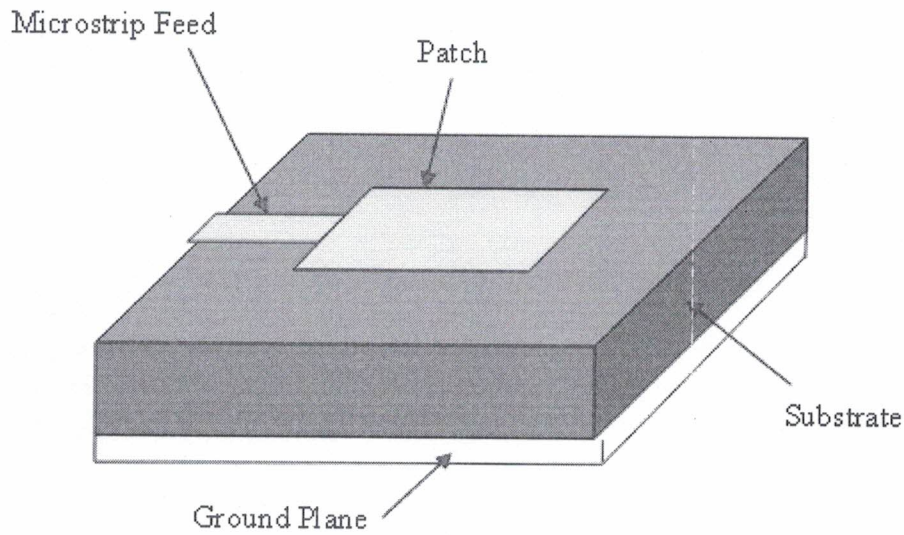


Fig 1. Structure of a microstrip patch antenna

Research Methodology

The research process consisted of analyzing the course curriculum of microwave subject, to determine the topic of teaching content and to define the behavioral objectives that provides a framework for the teaching [5]. However, presently the most instruction media have not several, have not enough for the students and uncomfortable by used. And then content is difficult to understand ect. In this research, we develop the research tools by analyzing the behavioral objectives that consist of the experimental set, the content sheets, PPT presentation and tests. The experimental sets of low pass filter circuit were developed using defined behavioral objectives. These consist of microstrip low pass filter using step-impedance, bandpass filter using open-loop microstrip resonator on double layer and parallel-coupled microstrip bandpass filter, as shown in Fig 2.

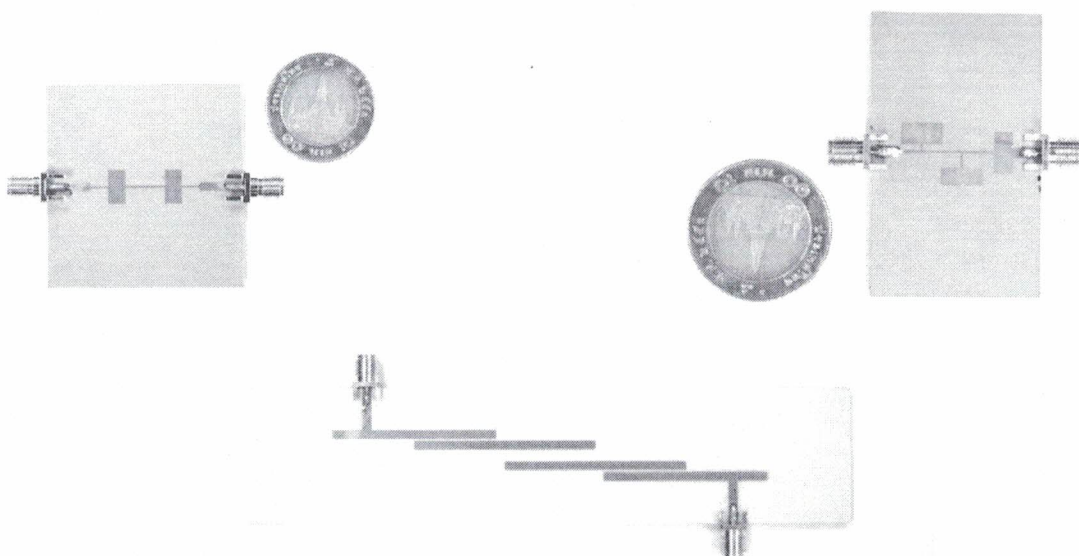


Fig 2. Circuit of design experimental set

Research Result

The research has been presented in three sections: a) the results of experimental set, b) the efficiency of the multimedia package on microstrip antenna and c) the student's satisfaction.

A) The results of experimental set

The experimental set consist of 3 sets, such as microstrip low pass filter using step-impedance, bandpass filter using open-loop microstrip resonator on double layer and parallel-coupled microstrip bandpass filter. Simulation based on theory to teach 3 lesson includes microstrip, resonance circuit, microwave filter circuit. We present an example of simulation design with theory microstrip low pass filter using step-impedance, as shown in Fig 3.

Fig 3 presents the results of microstrip low pass filter using step-impedance, we can calculate design of low pass filter circuit using chebyshev response. It was creating a calculated circuit diagram in an electromagnetic simulation program. The analyzed results are consistent with theory. [6]

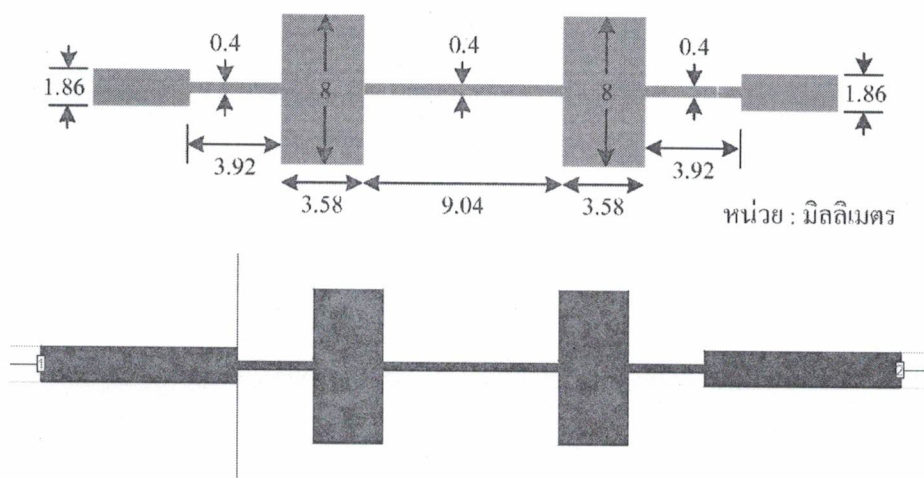


Fig 3. Microstrip low pass filter using step-impedance by simulate program IE3D

B) The efficiency of the multimedia package on microstrip antenna

The developed multimedia package for teaching in microwave course were evaluated by 3 experts whom have experience in the teaching on microwave engineering. The result found that the development of multimedia package was appropriate and quality can be used. The sampling was 15 student sample group who registered in microwave subject in industrial education program of Rajamangala University of Technology Phra Nakhon. The findings related to multimedia package had average score of total lesson test 80.44% and score of test 80.00%. So concluded that microstrip antenna had an efficiency of 80.44/80.00 which was higher than the standard of 80/80 according to the hypothesis, as shown in table 1.

Table 1. The results of efficiency of multimedia package

Score	N	\bar{X}	S. D.	Present
lesson test	15	12.07	0.10	80.44
test	15	24.00	0.17	80.00

C) The student's satisfaction

The developed of multimedia package was experimented by using 15 students who registered in microwave subject in industrial education program of Rajamangala University of Technology Phra Nakhon. The sample group was taught by using the developed of multimedia package in microwave

subject. After learning all lessons, we measured students' satisfaction of usage of developed multimedia package using questionnaire.

The findings after learning and teaching using the developed multimedia package are that the students have more knowledge and understanding of the course contents. Also the satisfaction of the students to developed multimedia package had mean value of 3.93 and S.D. equal to 0.84, as shown in table 2. Thus the developed multimedia package has good quality to use in the teaching of telecom-munication engineering of bachelor degree.

Table 2. The students' satisfaction of usage of developed multimedia package

List	\bar{X}	S.D.	Level Satisfaction
1. Learning and Teaching	3.85	0.86	High
2. PPT Presentation	3.94	0.86	High
3. Experimental set	3.98	0.83	High
4. Measurement and Evaluate	3.96	0.83	High
Average Total	3.93	0.84	High

Conclusions

This research has been presented the development of multimedia package on microstrip antenna for learning in telecommunication engineering of microwave subject which consists of experiment set and instruction tools. The conclusion of the findings is as following:

- 1) The developed experimental set can be used efficiently in the teaching of microwave subject. The measured results are correctly and consistent with the theory.
- 2) The developed multimedia package on microstrip antenna has content have easy to understand makes learning achievement better.

Overall the developed multimedia package on microstrip antenna were evaluated for efficiency of learning usage to accord engineering standard, therefore they may be used both theoretical and practical teaching.

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