Program Specification

For

Master of Science Degree

in

Electronics and Communications Engineering

Program Specification
For
Master of Science Degree in
Electronics and Communications Engineering

A- Basic Information

1- **Program title: M. Sc in Electronics and Communications Engineering.**

2- **Program type: Single** √ **Double** ☐ **Multiple** ☐

3- **Department (s): Electrical Engineering (Electronics and Communications Engineering Section).**

4- **Assistance Coordinator: Assist. Prof. Dr. Saly Saad Hassaneen**

5- **Coordinator: The Head of the Department**

6- **External evaluator(s): Prof. Dr. Ebrahim Abdel-Ghaffar Badran**

7- **Last date of program specifications approval: 2020 (Bylaw 2000).**

B- Professional Information

1- Introduction:

Electronics and Communications Engineering is constantly widening its scope in every field of engineering. The prime work of the Electronics and Communication engineer is to design, fabricate, produce, test and supervise the manufacturing of electronic and communication products for various industries. This postgraduate master program in Electronics and Communication Engineering supports the graduate students with high-quality level of theoretical knowledge and research skills to enable them add value in their professional practice and furthermore. Also, for the post graduate student who works as a demonstrators to be professional in doing researches in various fields of Electronics and Communications Engineering and transforms them to high-quality technical professionals and research scholars who can meet the requisite requirement of educational institutes, R&D organizations, and electronics and communication industry.

2- Graduate Attributes :

After completing the program the graduate would able to be:

A. Proficiency in the application of the basics and the methodologies of scientific research and the use of its different tools to serve professional practice in the field of Electronics and Communications Engineering.

B. Apply the analytical approach and using it in the field of electronics and communication engineering, as well as the topics that affect his/her professional practice.

C. Apply the specialized knowledge integrated with and the use of appropriate engineering tools, such as, computational facilities, laboratory equipment, necessary for his / her professional practice and project management.

D. Specialized engineering concepts related to his / her professional practice in the field of Electronics and Communications Engineering.

E. Show awareness of current problems and modern visions in the field of Electronics and Communications Engineering.

F. Identify professional problems and find solutions for it.

G. Mastery of an appropriate range of specialized professional and intellectual skills and the use of appropriate technology means to carry out a research study, writing a scientific methodology plain. Add new information to the knowledge and write scientific paper.

H. Communicate effectively and lead team works effectively.

I. Take good decisions in different professional contexts

J. Employ available resources to achieve and maintain the highest benefit

K. Show awareness of his / her role in community development and environmental conservation in the light of the global and regional variables

L. Display professional responsibilities and ethical, societal and cultural concerns.

M. Recognize the need to engage to develop him / her academically and being able to learn continuously in the field of Electronics and Communications Engineering.

3- Program Aims:

The graduate of the Master program must be able to:

1. Gain a depth of knowledge, understanding, and methodologies of scientific research including professional skills, pertinent software and appropriate technological means to make decisions, employ available resources efficiently, develop new skills to deal with high level complex problems, and engage in continuous learning practice in the field of electronics and communication engineering.
2. Demonstrate sufficient essential knowledge and a deep understanding of concepts, theories, and practice in the field of electronics and communication engineering, as well as the topics that affect his/her professional practice.
3. Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing electronics and communications engineering problems.
4. Communicate and lead team works effectively through professional system considering the detrimental impact of the engineer role on society, environment, societal and cultural concerns.
5. Demonstrate knowledge of contemporary, current, and advanced engineering issues related to

electronics and communications engineering problems.

6. Adopt basics and principles of quality and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.
7. Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.

4- Graduate Attributes with Program Aims:

Program Aims	Graduates Attributes
1. Gain a depth of knowledge, understanding and methodologies of scientific research including professional skills, pertinent software and appropriate technological means to make decisions, employ available resources efficiently, develop new skills to deal with a high level complex problems, and engage in continuous learning practice in the field of electronics and communication engineering.	A, G, I, and K
2. Demonstrate sufficient essential knowledge and a deep understanding of concepts, theories, and practice in the field of electronics and communication engineering, as well as the topics that affect his/her professional practice.	C, D, and G
3. Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, designing, and analyze risks of the professional practice in electronics and communications engineering.	B, E, F, and G
4. Communicate and lead team works effectively through professional system considering the detrimental impact of the engineer role on society, environment, societal and cultural concerns.	H, I, J, K, and L
5. Demonstrate knowledge of contemporary, current, and advanced engineering issues related to electronics and communications engineering problems.	G, E, and M
6. Adopt basics and principles of quality and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	L
7. Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	G

5- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communications Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program Intended Learning Outcomes (ILOs)	Program Objectives
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	2
A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	2
A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	4
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	5
A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	**6**
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	6
A6-1 Recognize basics and ethics of scientific research.	1, 4
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	1, 3
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	3
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	3
B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	7
B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.	3
B6-1Plan to improve progress performance in the field of electronics and communications engineering.	5
B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design, and development electronics and communications systems.	1
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	3

C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	1, 2, 5
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	7
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	3
D. General and transferrable skills	
D1-1 Express professional and communication skills effectively in different aspects.	4
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	2
D3-1 Apply self-evaluation and specify his educational needs related to electronics and communications aspects.	4, 6
D4-1 Design standards to evaluate others performance.	4, 6
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	2
D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	4
D7-1Demonstrate a high level of competence in the time management.	1, 4
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	1

6- Program Academic Reference Standards (ARS)

1- This program fulfills the Academic Reference Standards (ARS) guidelines of March 2009 for postgraduate programs prepared by the National Authority for Quality Assurance and Accreditation (NAQAAE) on 2009 - Supreme Council of Universities in Egypt, **(Appendix 1)**.

2- External references standards (Benchmarks)
External reference benchmark is selected to confirm the ILOs of the program from **Al-Quds University, Faculty of Engineering, Master of Science (M.Sc.) degree in the field of Electronics and Computer Engineering, (Appendix 1).**

Al-Quds University, Main Campus, Abu Dis, P.O Box 89 Main Campus - Abu-Dis:

Telephone: 00972-02-2756200, Fax: 00972-02-2793817

Admission Office: Telephone: 00972-02 -2756211

https://www.alquds.edu/en/postgraduate/postgraduate-programs-at-faculty-of-engineering/mece/140689-intended-learning-outcomes-ilos.html

7- Program Structure and Contents:

7.1 Program Duration: a minimum of 2 years & a maximum of 5 years (including one year of preparatory courses)

7.2 Program Structure: Awarding a Master Degree in Electronics and Communication Engineering required the study of courses amounting to 18 hours weekly for one academic year. Nine (9) hours of them are devoted to department basic requirements. The other nine (9) hours constitute specialized courses are selected by the supervision team and approved by the department council.

These courses are chosen from among the 5xx or 6xx – level and are directly related to the topic of his research. Also, required for awarding the Master Degree in Electronics and Communication Engineering is the execution of scientific research that terminated by writing a thesis containing the research results and its complete analysis and defending it successfully. More details can be found in postgraduate bylaw 2000.

7.3 Program Contents (Courses):

- **Department Basic Requirements Courses:**

Course Code	Course Title	Course Hours/Week	Marks Written Exam
SCI 603	Higher Mathematic	3	100
CCE 616	Advanced Programming Language	3	100
ECE 61X	Elective Course	3	100
Elective Course**			
ECE 610	Antennas	3	100
ECE 611	Microwave Electronics	3	100
ECE 617	Optics Engineering	3	100

** Select only one course.

- **Specialized Requirements Courses (5xx or 6xx level)***:**

Course Code	Course Title	Course Hours/Week	Marks Written Exam
5xx level			
ECE 500	Electrical Materials	3	100
ECE 501	Electronic Devices	3	100
ECE 502	Integrated Circuits Engineering	3	100
ECE 503	Computer Aided Circuit Design	3	100
ECE 504	Photovoltaic Systems	3	100
ECE 505	Economics of Electronic Projects	3	100
ECE 506	Active Circuits	3	100
ECE 507	Advanced TV Technology	3	100
ECE 508	Advanced Electronic Measurements	3	100
ECE 509	Communication Electronics	3	100
ECE 510	Industrial Electronics	3	100
ECE 511	Biomedical Electronics	3	100
ECE 512	Microprocessors and Interfacing Circuits	3	100
ECE 513	Integrated Circuits Technology	3	100
ECE 514	digital control Principles	3	100
ECE 515	Electromagnetic waves propagation	3	100
ECE 516	Introduction to statistical communication and information theory	3	100
ECE 517	Optics and Laser	3	100
ECE 518	Digital Communication theory	3	100
ECE 529	Mobile Communications	3	100

ECE 520	Satellite Communication Systems	3	100
ECE 521	Coding Theory	3	100
ECE 522	Optical Fibers	3	100
6xx level			
ECE 600	Electronics Materials	3	100
ECE 601	Digital Signal Processing Applications	3	100
ECE 602	Satellite Communication Systems	3	100
ECE 603	Digital Communication Systems	3	100
ECE 604	Mobile Communication Systems	3	100
ECE 605	Advanced Electronics Communication Systems	3	100
ECE 606	Data Communications	3	100
ECE 607	Transmission Systems	3	100
ECE 608	Network Planning	3	100
ECE 609	Local Area Network	3	100
ECE 610	Antennas	3	100
ECE 611	Microwave Electronics	3	100
ECE 612	Planner Microwave Circuits	3	100
ECE 613	Opto – Electronic Engineering	3	100
ECE 614	Integrated Optics Engineering	3	100
ECE 615	Optical Measurements	3	100
ECE 616	Optical Wave Guide Engineering	3	100
ECE 617	Optics Engineering	3	100
ECE 618	Optical Communication Systems	3	100
ECE 619	Microwave Theory and Techniques	3	100
ECE 620	Microwave Communication Systems	3	100
ECE 621	Random Signal Analysis	3	100
ECE 622	Theory of Electronic Navigation	3	100
ECE 623	Electronic Navigation Systems	3	100

*** Select only three courses related to the research topic.

Program Matrix:

The following table explains the ILO's (of the current program) – Course (main ILOs) matrix.

Program Matrix: ILO's (of the current program) – Course (main ILOs) matrix.

Courses Codes	ECE 5xx																							ECE 6xx																								SCI	CCE	Thesis
	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	603	616	
ILOs																																																		
A1-1								x					x		x		x			x		x			x		x	x		x															x	x	x	x	x	
A1-2	x	x	x	x	x		x	x	x	x	x	x		x		x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
A2-1	x	x	x	x			x	x						x					x	x	x			x		x	x	x		x				x	x	x	x	x					x	x			x			x
A3-1	x	x	x	x			x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x		x	x	x	x	x	x			x	x	x	x	x	x	x			x	x			x			x
A4-1						x																										x	x																	x
A5-1			x	x					x					x	x							x					x								x	x	x	x	x				x	x						x
A6-1																																																x		x
B1-1	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
B2-1			x	x	x			x					x	x	x		x					x								x							x	x				x			x	x				x
B3-1	x	x	x	x		x	x		x	x	x	x		x		x			x	x	x		x	x		x	x	x	x	x				x	x	x	x	x	x	x			x	x		x	x			x
B4-1																													x																					x
B5-1	x	x	x	x		x			x					x					x		x			x		x								x	x	x	x	x	x		x		x	x			x			x
B6-1																																																x		x
B7-1																																																x		x
C1-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	
C1-2									x	x							x								x				x			x	x						x		x				x	x			x	x
C2-1	x	x	x	x	x		x	x	x	x	x	x		x	x	x		x	x		x			x		x			x	x				x	x	x	x	x	x			x	x	x		x	x		x	x
C3-1					x				x									x			x					x													x		x	x					x			x
D1-1						x																																												x
D2-1						x				x			x		x		x		x	x		x			x		x	x	x																x				x	x
D3-1																																								x										x
D4-1																																								x										x
D5-1	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x		x			x	x	x			x	x	x	x	x	x	x	x	x	x	x		x	x		x	x
D6-1																																x																		x
D7-1																																x																		x
D8-1	x	x	x	x			x		x		x	x		x		x			x					x					x			x	x	x	x	x	x	x	x				x	x			x		x	x

8- Program admission requirements

The applicant to the Master of Science program in Electronics and Communications Engineering must hold a B.Sc. in Electrical Engineering (Specialized in Electronics and Communications Engineering) with a minimum grade of "Good" (which is equivalent to cumulative grade of 65%) from a recognized university in Egypt or an equivalent degree recognized by the supreme council of universities. More details can be found in the postgraduate bylaw 2000.

9- Methods and rules of evaluating students for the preparatory year

- Written examinations for the preparatory year after 30 weeks.

10- The regulations for starting the registration of the master thesis

The student must pass all the preparatory year's courses with at least pass grade (60%) in each course and pass the seminar and oral discussion in the thesis research topic which accomplished in the academic department.

The regulations for granting the degree of Master of Science for the student

- The student is required to do a seminar about his thesis and has to be approved by the academic department.
- The student is required to publish at least one scientific paper from the thesis in specialized journal or conference.
- The thesis is required to be approved by an examiners committee suggested by the academic department and approved by the faculty council (including at least one external examiner). The evaluation of the thesis and the discussion is carried out in an open session.
- More details can be found in postgraduate bylaw 2000.

Program Coordination Committee:

Program coordinator: **Assist. Prof. Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: / 10 /2020.

Appendix 1

The general Academic Reference Standard For MSc Degree

1- **The Academic Reference Standards (ARS)** guidelines of March 2009 for postgraduate programs prepared by the National Authority for Quality Assurance and Accreditation (NAQAAE) on 2009 - Supreme Council of Universities in Egypt.

2- External references standards (Benchmarks)

External reference benchmark is selected from Al-Quds University, of Engineering, Master of Science (M.Sc.) degree in the field of Electronics and Computer Engineering.

NAQAAE Academic Reference Standards (ARS)	Bench mark	Program Intended Learning Outcomes (ILOs)
A. Knowledge and understanding		
A1. Theories, basics, and specialized knowledge in the field of learning, as well as the subjects that affect his/her professional practice.	Identifying the different aspects of electronic and communication systems with regard to computer and software systems.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.
		A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.
A2- Mutual influence between professional practice and its impacts on the environment.		A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.
A3- Main scientific advances in the field of specialization.		A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	Applying both fundamental principles and advanced techniques of computing, electronics and communications successfully	A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.

	to a range of technical and engineering problems.	
A5- Basics and principles of quality in professional practice in the field of specialization.		A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.
A6- Basics and ethics of scientific research.	Recognizing social and national responsibility and ethics.	A6-1 Recognize basics and ethics of scientific research.
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	Identifying, analyzing and solving technical problems related to electronic, communication systems with regard to computer and software systems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.
B2- Solve specific problems on the basis of limited and contradictory information.	Having a minimum computer programming knowledge, understanding and skills to solve practical engineering problems related to electronic and communication systems.	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.		B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.
B4- Conduct a research study and/or writing systematic scientific study on Research problem.		B4-1 Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.
B5- Assess and analyze risks of the professional practice in the field of specialization.		B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.
B6- Plan to improve performance in the field of specialization.	Planning, designing, carrying out, evaluating and reporting research projects.	B6-1Plan to improve progress performance in the field of electronics and communications engineering.
B7- Take professional decisions in different professional practical contexts.		B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design, and development electronics and

		communications systems.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	Applying mathematical techniques to model and solve engineering problems related to electronic and communication systems.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.
	Appreciating and identifying electronic, communication, and computer issues related to product design; and generating and evaluating design solutions to solve a specific problem.	C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.
C2- Write and evaluate technical and professional reports.		C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.
C3- Evaluate means and tools available in the field of practice.		C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.
D. General and transferrable skills		
D1- Communicate effectively in different aspects.	Communicating effectively and presenting ideas and findings clearly in oral and written forms acquired through semester activities, projects and research theses.	D1-1 Express professional and communication skills effectively in different aspects.
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.		D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.
D3- Adopt self-assessment and specify the needs of personal learning.		D3-1 Apply self-evaluation and specify his educational needs related to electronics and communications aspects.
D4- Establish rules and indicators for assessing the performance of others.		D4-1 Design standards to evaluate others performance.
D5- Use different sources to obtain knowledge and		D5-1 Use different sources of information like library, internet access

information.		facilities, etc. to upgrade and enhance their conceptual knowledge.
D6- Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	Demonstrating self-learning and collaborating effectively with other members in a team.	D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.
D7- Demonstrate a high level of competence in the time management.		D7-1Demonstrate a high level of competence in the time management.
D8- Learn independently and seek continuous learning.		D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.

Courses Specification

For

Master of Science Degree

in

Electronics and Communications Engineering

ECE 500
Electrical Materials
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Electrical Materials	**Code Symbol: ECE 500**	
Lecture	**3 Hours**	
Tutorial / Laboratory	**-**	
Total	**3 Hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in solid state engineering and electrical materials. For those students who look toward an industrial position after graduation, this course is designed to widen background in material engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of solid state engineering and material science: metals, semiconductors, and superconductors, optical, magnetic, and amorphous materials. The course is meant to create the background needed to understand the physics of device operations and also prepare students for advanced courses in solid state and quantum electronics. General electrical materials physics and properties will be taught in the context of technological applications. Emphasis will be on Semiconductor hetero-junctions materials, dielectric materials, and magnetic materials.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain the basic knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to electrical materials.
2. Develop advanced skills in the definition, identify, analysis, and solving of problems related to electrical materials.
3. Construct models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using electrical materials.
4. Gain the ability to deal effectively with classical and quantum statistics to identify/solve complex and open ended engineering problems related to electrical materials.
5. Apply the basics and the methodologies of scientific research and the use of its different tools in the area of electrical materials.
6. Build specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of electrical materials.

3- Intended Learning Outcomes (ILOs):

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the electrical materials according to their physical structure and properties. a1-2-2 Recognize the energy band structure and the lattice vibration process. a1-2-3 Discuss the classical and quantum statistics of electron and hole motion in atoms and crystal. a1-2-4 Discuss the basics differences between the most common electrical materials(Dielectric , magnetic and semiconductor materials) according to their physical structure and conductivity. . a1-2-5 Explain the thermionic emission process. a1-2-6 Describe the thermal and optical effects. a1-2-7 Explain the hetro-juctions materials operation principles.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	a2-1-1Recognize the professional aspects of electrical material applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1Demonstrate knowledge of contemporary, current, and advanced topics related to electrical material and its application paradigms.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electrical materials.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electrical materials.
B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for electrical materials development.

C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electrical materials problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write a professional report on Photonic semiconductor materials.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electrical materials types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1Exhibit the ability to learn more about electrical materials.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- The material crystal structure concepts and properties	12	12	--
2- Energy band structure and lattice vibrations	12	12	--
3- Classical and quantum statistics of Electrons and Holes	12	12	--
4- Generation and recombination process	24	24	--
5. Dielectric and Magnetic Materials.	6	6	
6- Thermo Ionic Emission.	6	6	--
7- Thermal and Optical Effects.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2 -1, A3-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1 , D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	The material crystal structure concepts and properties	1-4
2nd	Energy band structure and lattice vibrations	5-8
3rd	Classical and quantum statistics of Electrons and Holes	9-12
4th	Generation and recombination process	13 - 20
5th	Dielectric and Magnetic Materials	21-22
6th	Thermo Ionic Emission.	23-24
7th	Thermal and Optical Effects.	25-28

8- ILOs Matrix Topics

Course ILOs	Course topics						
	1st	2nd	3rd	4th	5th	6th	7th
a1-2-1 Classify the electrical materials according to their physical structure and properties.	x						
a1-2-2 Recognize the energy band structure and the lattice vibration.		x					
a1-2-3 Discuss the classical and quantum statistics of electron and hole motion in atoms and crystal.			x				
a1-2-4 Discuss the basics differences between the most common electrical materials (Dielectric , magnetic and semiconductor materials) according to their physical structure and conductivity. .				x			
a1-2-5 Explain the thermionic emission process and the thermal and optical effects.					x	x	
a1-2-6Describe the thermal and optical effects.							x
a1-2-7Explain the hetro-juctions materials operation principles.	x						x
a2-1-1Recognize the professional aspects of electrical materials applications and their effects on the Environment.				x	x	x	
a3-1-1Demonstrate knowledge of contemporary, current, and advanced topics related to electrical material and its				x	x	x	x

application paradigms.							
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electrical materials.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to hetro-juctions electrical materials.							x
b5-1-1 Evaluate pros and cons of given methodologies for electrical materials development.				x			x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electrical materials problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c2-1-1 Write a professional report on Photonic semiconductor materials.						x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electrical materials types and technology.				x		x	x
d8-1-1Exhibit the ability to learn more about electrical materials.				x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture + online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x			x					
	a2-1-1	x		x		x			x					
	a3-1-1	x		x					x					
Intellectual Skills	b1-1-1					x								
	b3-1-1					x								
	b5-1-1		x	x					x	x				
Professional	c1-1-1					x								

Skills	c2-1-1		x	x					x	x				
	d5-1-1		x						x	x				
	d8-1-1		x						x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Gordon T Dyos; The Institution of Engineering and Technology"Electrical Resistivity Handbook", IET, 2012.

- Rolfe E. Hummel "Electronic Properties of Materials ", Springer, Third Edition, 2004.

13- Program Coordination Committee:

Course Coordinator: **Dr. Rania Mohamed Abdallah**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

10/2020

ECE 501
Electronic Devices
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Electronic Devices	**Code Symbol: ECE 501**	
Lecture	**3 Hours**	
Tutorial / Laboratory	**-**	
Total	**3 Hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in solid state engineering and electronic materials that are used in the realization of electronic devices and the physical phenomena in semiconductor devices. For those students who look toward an industrial position after graduation, this course is designed to widen background in material engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of solid state engineering and material science: metals, semiconductors, and superconductors, optical, magnetic, and amorphous materials. The course is meant to create the background needed to understand the physics of device operations and also prepare students for advanced courses in solid state and quantum electronics. This course will also provide students with a basis for understanding the characteristics, modeling, operation, and limitation of semiconductor devices. The final aim is that the students have to be realized that semiconductor devices have permeated the electronic and communication applications.

2- Course Objectives:

The main Objectives of this course are to:

1. Describe the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices.

2. Gain the basic knowledge and understanding of the basic physical concepts of the PN-junction and the bipolar transistors operation and their static and dynamic IV characteristics.
3. Classify the Field Effect Transistors (JFET, Enhancement MOSFET and Depletion MOSFET) according to their physical structure and operational principles with understanding the basic physical concepts of their operation, static and dynamic IV characteristics.
4. Select appropriate mathematical factions and methods to develop analytical models for I-V characteristics of Bipolar and FET semiconductor transistors.
5. Classify the photonic semiconductor devices according to their physical structure and operational principles with understanding the physics-based phenomena to describe their operation.

3- Intended Learning Outcomes (ILOs):

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Explain the concepts and theories of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. a1-2-2 Describe the concepts and theories of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. The energy band structure and the lattice vibration process. a1-2-3 Express the concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. The classical and quantum statistics of electron and hole motion in atoms and crystal. a1-2-4 Explain the concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. the basic physical concepts of the P-N junction operation, modeling, and its static and dynamic

	IV characteristics. a1-2-5 Explain the basic physical concepts of the Bipolar transistor operation, modeling, and its static and dynamic IV characteristics. a1-2-6 Discuss the basic physical concepts of the depletion MOFET operation, its modeling, and its static and dynamic IV characteristics. a1-2-7 Describe the basic physical concepts of the enhancement MOFET operation, its modeling, and its static and dynamic IV characteristics.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	a2-1-1 Discuss the professional aspects of electronic device applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronic device and its application paradigms.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic devices and Select appropriate mathematical functions and methods to develop analytical models for I-V characteristics of PN-Junction, Bipolar and MOSFET semiconductor device.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electronic devices.
B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for electronic devices development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electronic devices problems, using latest engineering techniques, skills, tools and problem solving ability in the completion related to semiconductor devices.
C2-1 Write and evaluate a professional technical report pertaining to electronics and	c2-1-1 Write a professional report on Photonic semiconductor materials and use software

communications technical matters.	packages such as workbench to draw the I-V characteristics of PN Diode, Bipolar and FET transistors.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic devices types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about electronic devices.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1. The basic concepts of materials science, Materials categories – Energy band diagrams for different materials categories – Basics of semiconductor material physics - Current in semiconductors - optical properties of materials	12	12	--
2- PN-Junction Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and small-signal models.	12	12	--
3- Bipolar junction transistor (BJT) Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and small-signal models.	12	12	--
4- Depletion MOSFET Metal Oxide Semiconductor (MOS) Capacitor Electronics - MOSFET Types. Depletion MOSFET: Structure; Qualitative physical operation; Quantitative; physical operation analysis - Static and dynamic characteristics; DC and Small Signal models.	12	12	--
5. Enhancement MOSFET Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and Small Signal models.	24	24	
6- **Basics of photonic devices** Radiative transition and optical absorption - Light emitted diode - Semiconductor Leaser – Photodetector - Solar Cell.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	Academic Reference Standard (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2 -1, A3-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1 , D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1. The basic concepts of materials science, Materials categories – Energy band diagrams for different materials categories – Basics of semiconductor material physics - Current in semiconductors -	1-4
2nd	2- PN-Junction Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and small-signal models.	5-8
3rd	3- Bipolar junction transistor (BJT) Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and small-signal models.	9-12
4th	4- Depletion MOSFET Metal Oxide Semiconductor (MOS) Capacitor Electronics - MOSFET Types. Depletion MOSFET: Structure; Qualitative physical operation; Quantitative; physical	13 - 16
5th	5. Enhancement MOSFET Structure - Qualitative physical operation - Quantitative physical operation analysis - Static and dynamic characteristics - DC and Small Signal models.	17-24
6th	6- Basics of photonic devices Radiative transition and optical absorption - Light emitted diode - Semiconductor Leaser – Photodetector - Solar Cell.	25-28

8- ILOs Matrix Topics

Course ILOS	Course topics					
	1st	2nd	3rd	4th	5th	6th
a1-2-1 Explain the concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices.	x					
a1-2-2Describe the concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. The energy band structure and the lattice vibration process.		x				
a1-2-3 Express the concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. The classical and quantum statistics of electron and hole motion in atoms and crystal.			x			
a1-2-4 Explainthe concepts and theorems of mathematics and the underlying physical phenomena of semiconductor materials that are used in the realization of electronic devices. The basic physical concepts of the P-N junction operation, modeling, and its static and dynamic IV characteristics.				x		
a1-2-5 Explain the basic physical concepts of the Bipolar transistor operation, modeling, and its static and dynamic IV characteristics.					x	x
a1-2-6Discuss the basic physical concepts of the depletion MOFET operation, its modeling, and its static and dynamic IV characteristics.				x	x	
a1-2-7Describe the basic physical concepts of the enhancement MOFET operation, its modeling, and its static and dynamic IV characteristics.				x		
a2-1-1Discuss the professional aspects of electronic device applications and their effects on the Environment.				x	x	x
a3-1-1Demonstrate knowledge of contemporary, current, and advanced topics related to electronic device and its application paradigms				x	x	x

b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic devices and Select appropriate mathematical functions and methods to develop analytical models for I-V characteristics of PN-Junction, Bipolar and MOSFET semiconductor device.	x	x	x	x	x	x
b3-1-1Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electronic devices.						x
b5-1-1 Evaluate pros and cons of given methodologies for electronic devices development				x		
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electronic devices problems, using latest engineering techniques, skills, tools and problem solving ability in the completion related to semiconductor devices.	x	x	x	x	x	x
c2-1-1 Write a professional report on Photonic semiconductor materials and use software packages such as workbench to draw the I-V characteristics of PN Diode, Bipolar and FET transistors.						x
d5-1-1Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic devices types and technology.				x		x
d8-1-1Exhibit the ability to learn more about electronic devices.				x	x	x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								

	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x								
	a2-1-1	x		x		x			x					
	a3-1-1	x		x					x					
Intellectual Skills	b1-1-1					x								
	b3-1-1					x								
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1					x								
	c2-1-1		x	x					x	x				
	d5-1-1		x						x	x				
	d8-1-1		x						x	x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination: : To assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- S. M. Sze and Kwok K. Ng, "Physics of Semiconductor Devices ", 3rded. John Wiley and Sons.2007.
- R. C. Jaeger, "Microelectronic Circuit Design", 5th Ed. McGraw-Hill Education. 2015.

- S. O. Kasap, “Optoelectronics and Photonics: Principles and Practices,” 2nd Edition, Pearson, NJ, USA, 2013.
- SlawomirSujecki, "Photonics Modeling and Design", CRC Press, 2014
- R. F. Pierred and G. W. Neudeck "Modular Series on SolidStatedevices", Addison-Wesley Publishing Company, Vol.1, 2, 3, 4, 1983.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Rania Mohamed Abdallah**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. RawyaYehia Rizk**

10/2020

ECE 502

Integrated Circuits Engineering

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Integrated Circuits Engineering	**Code Symbol: ECE 502**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in analog and digital integrated circuits. The course aims to familiarize the students with the basic building blocks of analog integrated circuits such as differential amplifier, current source, current mirror, and bandgap reference. The student must be able to design a typical operational-amplifier circuitry taking into account its non ideal characteristics. Also, one of the main aims of this course is to extend the student's knowledge with the basic MOS- and bipolar-IC logic circuit families and the semiconductor memories. This course is also designed to widen the student's background in the realm of integrated-circuits fabrication and processing steps.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of basic analog integrated circuits such as differential amplifier, current source, current mirror, and bandgap reference.
2. Analyze and design the analog integrated circuits.
3. Build the ability to extend knowledge and develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using main components of analog integrated circuits.
4. Identify and solve complex and open ended engineering problems related to integrated circuits design and implementation.
5. Inspect the methodologies of scientific research and the use of its different tools in the area of integrated circuits.
6. Apply specialized knowledge and combine it with relevant knowledge in his / her

professional practice in the area of integrated circuits.
7. Analyze advanced integrated circuits.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the different components of analog integrated circuits. a1-2-2 Demonstrate sufficient essential knowledge and a deep understanding to analyze and design both analog and digital integrated circuits. a1-2-3 Describe different effective techniques and methods, such as the analysis by inspection, to analyze and design integrated circuits. a1-2-4 Explain the operation of the main types of semiconductor memories. a1-2-5 Classify the basic digital IC technologies and the associated logic-circuit families. a1-2-6 Discuss the basics integrated circuits fabrication techniques. a1-2-7Explain the most important integrated circuits characterization techniques. a1-2-8Demonstrate a basic understanding of the devices used in analog and digital integrated circuits.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 discuss social effects of analog and digital integrated circuits.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of analog and digital integrated circuits.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of analog and digital integrated circuits.
B. Intellectual skills	

B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to analog and digital integrated circuits and their applications.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 identify and apply appropriate methods for discrimination of physics-based integrated-circuit device models in the context of specific technological constraints .
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to analog and digital integrated circuits and their applications.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for analog and digital integrated circuits development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to integrated circuits problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write a professional report on integrated circuits.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about analog and digital integrated circuits and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about analog and digital integrated circuits.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Analysis of main types of BJT and MOS amplifier circuits.	12	12	--
2- Analysis by inspection.	6	6	--
3- Differential amplifiers.	6	6	--
4- Current sources and current mirrors.	6	6	--
5- Frequency response.	6	6	--
6- Feedback topologies.	6	6	--
7- Evaluation of logical effort and power consumption.	12	12	--
8- BJT logic-circuit families.	6	6	--
9- MOS logic-circuit families.	6	6	--
10- Semiconductor memories.	6	6	--
11- Integrated-circuits fabrication.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B2-1, B3-1, B5-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	60%	10%	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Analysis of main types of BJT and MOS amplifier circuits.	**1-4**
2nd	2- Analysis by inspection.	**5-6**
3rd	3- Differential amplifiers.	**7-8**
4th	4- Current sources and current mirrors.	**9-10**
5th	5- Frequency response.	**11-12**
6th	6- Feedback topologies.	**13-14**
7th	7- Evaluation of logical effort and power consumption.	**15-18**
8th	8- BJT logic-circuit families.	**19-20**
9th	9- MOS logic-circuit families.	**21-22**
10th	10- Semiconductor memories.	**23-24**
11th	11- Integrated-circuits fabrication.	**25-28**

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
Course ILOs	**Knowledge & Understanding**										
a1-2-1 Classify the different components of analog integrated circuits.	x	x	x								
a1-2-2Demonstrate sufficient essential knowledge and a deep understanding to analyze and design both analog and digital integrated circuits.	x	x	x								
a1-2-3 Describe different effective techniques and				x		x		x			

methods, such as the analysis by inspection, to analyze and design integrated circuits.											
a1-2-4 Explain the operation of the main types of semiconductor memories.					x						
a1-2-5 Classify the basic digital IC technologies and the associated logic-circuit families.							x				
a1-2-6 Discuss the basics integrated circuits fabrication techniques.									x		
a1-2-7Explain the most important integrated circuits characterization techniques.										x	
a1-2-8Demonstrate a basic understanding of the devices used in analog and digital integrated circuits.											x
a2-1-1 Discuss social effects of analog and digital integrated circuits.	x										
a3-1-1 Classify the Potential applications of analog and digital integrated circuits.											x
a5-1-1 Explain quality assurance concepts of analog and digital integrated circuits											x
Course ILOs	**Intellectual Skills**										
b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to analog and digital integrated circuits and their applications.	x	x	x	x	x	x	x	x	x	x	x
b2-1-1 Identify and apply appropriate methods for discrimination of physics-based integrated-circuit device models in the context of specific technological constraints .				x		x		x			

b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to analog and digital integrated circuits and their applications.				x		x		x			
b5-1-1 Evaluate pros and cons of given methodologies for analog and digital integrated circuits development.				x		x		x			

Course ILOs	**Professional Skill**										
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to integrated circuits problems, using latest engineering techniques, skills, and tools.				x		x		x			
c2-1-1 Write a professional report on integrated circuits.											x
Course ILOs	General Skills										
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about analog and digital integrated circuits and technology.									x	x	
d8-1-1Exhibit the ability to learn more about analog and digital integrated circuits.											x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8								x					x
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1									x		x		
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1				x	x				x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

[1] A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, Seventh Edition, New York: Oxford, 2015.

[2 R. C. Jaeger, T. N. Blalock, *Microelectronic Circuit Design*, Second Edition, McGraw-Hill, 2004.

[3] B. Razavi, *Design of Analog CMOS Integrated Circuits*, McGraw-Hill Higher Education, Second Edition, 2017.

[4] N. H. E. Weste and D. M. Harrid, *CMOS VLSI Design: A Circuits and Systems Perspective*, Fourth Edition, Addison-Wesley, 2011.

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif M. Sharroush**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizq**

10/2020

ECE 503

Computer-Aided Circuit Design

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: **Computer Aided Circuit Design**	**Code Symbol: ECE 503**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in SPICE simulator. The course aims to familiarize the students with the basic components that can be defined in SPICE. The student must be able to describe a typical integrated circuits using SPICE. Also, one of the main aims of this course is to extend the student's knowledge with the main types of analyses in SPICE and convergence issues.

2- Course Objectives:

The main objectives of this course are to:

1. Collectbasic commands related to main components in integrated circuits.
2. Establish advanced skills in the analysis and design of integrated circuits using SPICE.
3. Discuss the main command for plots in SPICE.
4. Theorize the main commands for analyses types in SPICE.
5. Critique the main convergence issues in SPICE.
6. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of simulation of integrated circuits.
7. Simulate and redesign advanced integrated circuits.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the different simulators used with integrated-circuit design. a1-2-2Demonstrate the various commands used with SPICE. a1-2-3 Describe different types of analyses used in analyzing and designing integrated circuits. a1-2-4 Explain the various plotting commands used in SPICE. a1-2-5 Classify the various analyses types.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Discuss social effects of simulating integrated circuits.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of simulating analog and digital integrated circuits.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of simulation.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to analog and digital integrated circuits and their applications.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory	b2-1-1 Identify and apply appropriate methods for simulating integrated circuits.

information) related to electronics and communications engineering.	
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of simulators.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of different types of simulators.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to convergence issues.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write a professional report on simulating a typical integrated circuit.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about SPICE and other integrated-circuits simulators.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1Exhibit the ability to learn more about simulation.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- A general overview at simulation.	12	12	--
2- Discussion of various simulators.	6	6	--
3- Describing various components in SPICE.	6	6	--
4- Performing various analyses in SPICE.	6	6	--
5- Continue to performing various analyses in SPICE	6	6	--
6- Frequency response in SPICE.	6	6	--

7-.Treating with various plots in SPICE.	12	12	--
8- Simulating typical integrated circuits.	6	6	--
9- Continue to simulating typical integrated circuits.	6	6	--
10- Causes of convergence errors.	6	6	--
11- Treating with convergence issues.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B2-1, B3-1, B5-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	60%	10%	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- A general overview at simulation.	**1-4**
2nd	2- Discussion of various simulators.	**5-6**
3rd	3- Describing various components in SPICE.	**7-8**
4th	4- Performing various analyses in SPICE.	**9-10**
5th	5- Continue to performing various analyses in SPICE	**11-12**
6th	6- Frequency response in SPICE.	**13-14**
7th	7-.Treating with various plots in SPICE.	**15-18**
8th	8- Simulating typical integrated circuits.	**19-20**
9th	9- Continue to simulating typical integrated circuits.	**21-22**

10th	10- Causes of convergence errors.	**23-24**
11th	11- Treating with convergence issues.	**25-28**

8- <u>ILOs Matrix Topics</u>

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**	**11th**
Course ILOs	**Knowledge & Understanding**										
a1-2-1 Classify the different simulators used with integrated-circuit design. a1-2-2Demonstrate the various commands used with SPICE. a1-2-3 Describe different types of analyses used in analyzing and designing integrated circuits. a1-2-4 Explain the various plotting commands used in SPICE. a1-2-5 Classify the various analyses types.	x	x	x								
a2-1-1 Discuss social effects of simulating integrated circuits.	x	x	x								
a3-1-1 Classify the Potential applications of simulating analog and digital integrated circuits.				x		x		x			
a5-1-1 Explain quality assurance concepts of simulation.					x						
Course ILOs	**Intellectual Skills**										
b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to analog and digital integrated circuits and their applications.	x	x	x	x	x	x	x	x	x	x	x

b2-1-1 identify and apply appropriate methods for simulating integrated circuits.				x		x		x			
b3-1-1 Analyze, interpret and manipulate data from a variety of simulators.				x		x		x			
b5-1-1 Evaluate pros and cons of different types of simulators.				x		x		x			

Course ILOs	**Professional Skill**										
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to convergence issues.				x		x		x			
c2-1-1 Write a professional report on simulating a typical integrated circuit.											x
Course ILOs	General Skills										
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about SPICE and other integrated-circuits simulators.									x	x	
d8-1-1Exhibit the ability to learn more about simulation.											x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								

	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1									x		x		
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1				x	x				x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

1. C. K. Sarkar, *Technology Computer Aided Design: Simulation for VLSI MOSFET*, CRC Press, 2013.

2. F. J. Hill, *Computer Aided Logical Design with Emphasis on VLSI*, Wiley, Fourth Edition, 1993.

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif M. Sharroush**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

10/2020

ECE 504
Photovoltaic Systems
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Photovoltaic Systems	**Code Symbol: ECE504**	
Lecture	**3 hours**	
Tutorial / Laboratory	**0 hours**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the post-graduate students with a solid background and the physical principles of the Photovoltaic (PV) systems. Also, the structure of photovoltaic systems, and how to design photovoltaic systems to supply stand-alone load will be considered.The student will be able to make intelligent decisions based upon a clear understanding of theparameters involved.

2- Course Objectives:

1. Build the basic necessary background in Photovoltaic (PV) cells, modules, arrays and systems.
2. Revise the Energy StorageTechnologies.
3. Review the connections methods of sunlight collectors, PV system and generators.
4. ClassifyPhotovoltaic (PV) system components.

3- Intended Learning Outcomes (ILOs):

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge & Understanding	A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	**a-1-2-1 Discuss the basic Specifics of sunlight necessary for understanding Solar Spectrum and how to Capture Sunlight.** **a1-2-2Describe the Energy StorageTechnologies.** **a1-2-3Explain the principles of design of photovoltaic system.** **a1-2-4Describe the importance of charge controllers, Inverters and generators.** **a1-2-5Explain Switches, Circuit Breakers, Fuses, and Receptacles.**

		a1-2-6 Describe the Ground Fault, Arc Fault, Surge, and Lightning Protection. **a1-2-7Explain the difference between Stand-Alone Photovoltaic andgrid-connected Systems.**
Intellectual skills	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	**b1-1-1 Describe the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toPhotovoltaic (PV) systems**
	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	**b2-1-1Solve specialized problems with available givens and parameters in Photovoltaic (PV) system components, Generators, Inverters, and Economic Considerations.**
Professional skills	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	**c1-1-1 Describe knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solveproblems pertaining toPhotovoltaic (PV) systems**
	C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	**c2-1-1write reports about the evaluation of the performance of the current Photovoltaic (PV) systems.**
	C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	**c3-1-1Evaluate methods and tools reported in a specified published articles and researches concerningPhotovoltaic (PV) system components, Generators, Inverters, and Economic Considerations.**
General skills	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	**d5-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in Photovoltaic (PV) systems.**

4-Course Contents

Week No.	Topic	Total Hours	Contact hrs		
			Lec.	Tut.	Lab.

Week 1+2	**Lecture:** Introduction to Photovoltaic (PV) systems.	6	6	-	
Week 3+4	**Lecture:** Sunlight Specifics	6	6		
Week 5+6+7	**Lecture:** Energy Storage Technologies.	9	9		
Week 8+9+10	**Lecture:** Generators, Switches, Circuit Breakers, Fuses, and Receptacles.	9	9		
Week 11+12+13	**Lecture:** Grid-Connected Utility-Interactive Photovoltaic Systems	9	9		
Week 14+15+16+17+18	**Lecture:** Battery-Backup Grid-Connected Photovoltaic Systems	15	15		
Week 19+20+21+22+23+24	**Lecture:** Stand-Alone Photovoltaic Systems.	18	18		
Week 25	**Lecture:** Economic Considerations	3	3		
Week 26+27	**Lecture:** The Physics of Photovoltaic Cells	6	6		
Week28	General Revision.	3	3		
Total	**84 hour**				

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2	B1-1, B2-1	C1-1, C2-1, C3-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to Photovoltaic (PV) systems.	1-2
2nd	Sunlight Specifics	3-4
3th	Energy Storage Technologies..	5-7
4th	Generators, Switches, Circuit Breakers, Fuses, and Receptacles.	8-10
5th	Grid-Connected Utility-Interactive Photovoltaic Systems.	11-13
6th	Battery-Backup Grid-Connected Photovoltaic Systems.	14-18
7th	Stand-Alone Photovoltaic Systems.	19-24
	Economic Considerations	25
	The Physics of Photovoltaic Cells. with revision	26-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics						
		1st	2nd	3rd	4th	5th	6th	7th
Knowledge & Understanding	**a-1-2-1Discuss the basic Specifics of sunlight necessary for understanding Solar Spectrum and how to Capture Sunlight.**	X						
	a1-2-2Describe the Energy StorageTechnologies.		X					
	a1-2-3Explain the principles of design of photovoltaic system.			X				
	a1-2-4Describe the importance of charge controllers, Inverters and generators..				X			
	a1-2-5Explain Switches, Circuit Breakers, Fuses, and Receptacles.					X		
	a1-2-6 Describe the Ground Fault, Arc Fault, Surge, and Lightning Protection.						X	
	a1-2-7 Explain the differencebetweenStand-Alone Photovoltaic andgrid-connected Systems							X
Intellectual Skills	**b1-1-1 Describe the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toPhotovoltaic (PV) systems**		X	X	X	X	X	X
	b2-1-1Solve specialized problems with available givens and parameters in Photovoltaic (PV) systemcomponents, Generators, Inverters, and Economic Considerations.			X			X	
Professional	**c1-1-1 Describe knowledge of mathematics, science, information**	X	X	X	X	X	X	X

Skill	**technology, design, numerical modeling, modern and principle of professional skills to solveproblems pertaining toPhotovoltaic (PV) systems**							
	c2-1-1write reports about the evaluation of the performance of the current Photovoltaic (PV) systems.					x	x	x
	c3-1-1Evaluate methods and tools reported in a specified published articles and researches concerningPhotovoltaic (PV) system components, Generators, Inverters, and Economic Considerations.			x			x	
General Skills	**d5-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in Photovoltaic (PV) systems.**			x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x								
Intellectual Skills	b1-1-1					x							x	
	b2-1-1					x							x	
Professional Skills	c1-1-1					x			x	x				
	c2-1-1		x						x	x				
	c3-1-1							x					x	
General Skills	d5-1-1								x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. Roger Messenger and Homayoon "Amir" Abtahi, Photovoltaic SystemsEngineering, CRC Press, Fourth Edition 2017.

2. Fthenakis, Vasilis M.; Lynn, Paul A, Electricity from sunlight: photovoltaic-systems integration and sustainability, John Wiley & Sons Ltd, Second Edition, 2018.

13- Program Coordination Committee:

.Course Coordinator **Program Coordinator**

Dr. Islam ElsayedShaalan **Dr. Saly Saad Hassaneen**

Head of the Department

Prof. Dr. Rawya Yehia Rezk

Electrical Engineering Dept. Faculty of Engineering-Port Said.

10/2020

ECE 505
Economics of Electronic Projects
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electronics and Communications Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	***2020***

A- Basic Information

Title: Economic of Electronic Projects	**Code Symbol**: **ECE 505**	
Lecture	3 hours	
Tutorial / Laboratory	**-**	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to equip the program graduate with the basic business and economic concepts related to managing successful electronic projects. Economic, time, and performance parameters of engineering projects are analyzed from the organizational and resource perspectives. Network optimization and simulation concepts are introduced. Fundamental engineering economics concepts are introduced and applied to planning and managing projects. Course topics include Decision-making and cash-flow diagrams, interest, worth: present/annual, Rate of return, Breakeven, Depreciation and taxes, Project definition, Project network, scheduling resource and cost, Managing project risk, Project progress, performance measurement, and evaluation.

2- Course Objectives:

- Perform economic calculations involving the time value of money using standard formulas and tables
- Compare alternatives using net present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis
- Apply project management techniques to create a structured project plan that includes resource and cost analysis
- Understand project risk includes risk assessment, mitigation plans and contingency plans
- Apply project management and spreadsheet software to create project management and financial documents such as work breakdown structures, Gantt charts, network diagrams, schedules, financial reports, and status reports

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	**Program ILOs**	**Course ILOs**
A. Knowledge and understanding		
A4- Fundamentals of ethical & legal professional practice in the field of specialization.	A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	a4-1-1 Explain legal economic practice in managing electronic projects
B. Intellectual skills		
B3- Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1Compare alternatives using netpresent worth, equivalent annual worth, internal rate of return, and benefit-cost analysis present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis
B5- Assess and analyze risks of the professional practice in the field of specialization.	B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.	b5-1-1 Analyze project risk includes risk assessment, mitigation plans and contingency plans
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Calculate economic involving the time value of money using standard formulas and tables
		c1-1-2 Discuss project management techniques to create a structured project plan that includes resource and cost analysis
D. General and transferrable skills		
D1-Communicate effectively in different aspects.	D1-1 Express professional and communication skills effectively in different aspects .	d1-1-1 Express professional and communication skills effectively in business aspect.
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Demonstrate efficient IT skills in various project management tools.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical/Tutorial Hours
1. Decision-makingandcash-flowdiagrams	**12**	**12**	--
2. Interest	6	6	--
3. Worth: present/annual	**6**	**6**	--
4. Rate of return	**6**	**6**	--
5. Breakeven	6	6	--
6. Depreciation and taxes	**6**	**6**	--
7. Project definition	6	6	--
8. Project network, scheduling resource and cost	**12**	**12**	--
9. Managing project risk	12	12	--
10. Project progress, performance measurement, and evaluation	12	12	--
Total	**84**	**84**	**--**

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A4-1	B3-1, B5-1	C1-1	D1-1, D2-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
40%	---	20%	20%	20%	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Decision-making and cash-flow diagrams	1-4
2nd	Interest	5-6
3rd	Worth: present/annual	7-8

4th	Rate of return	9-10
5th	Breakeven	11-12
6th	Depreciation and taxes	13-14
7th	Project definition	15-16
8th	Project network, scheduling resource and cost	17-20
9th	Managing project risk	21-24
10th	Project progress, performance measurement, and evaluation	25-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**	
Course ILOs	**Knowledge & Understanding**										
a4-1-1 Explain legal economic practice in managing electronic projects	x	x	x	x	x	x	x	x	x	x	
Course ILOs	**Intellectual Skills**										
b3-1-1 Compare alternatives using net present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis			x	x	x		x		x	x	
b5-1-1 Analyze project risk includes risk assessment, mitigation plans and contingency plans								x	x	x	
Course ILOs	**Professional Skill**										
c1-1-1 Calculate economic involving the time value of money using standard formulas and tables	x	x	x	x	x	x	x	x	x	x	
c1-1-2 Discuss project management techniques to create a structured project plan that includes resource and cost analysis	x	x	x	x	x	x	x	x	x	x	
Course ILOs	General Skills										
d1-1-1 Express professional and communication skills effectively in business aspect.					x			x	x	x	

d2-1-1 Demonstrate efficient IT skills in various project management tools.					x			x	x	x	

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ **online sessions**	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a4-1-1	x			x	x								
Intellectual Skills	b3-1-1				x	x								
	b5-1-1				x	x			x		x			
Professional Skills	c1-1-1				x	x			x		x			
	c1-1-2		x	x				x	x	x				
General Skills	d1-1-1							x						
	d2-1-1		x							x				

9- Assessment

9.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. laboratory Usage:

None required

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Abol Ardalan, Economic and Financial Analysis for Engineering and Project Management, CRC Press; 1st edition (October 13, 1999)

12- Program Coordination Committee:

Course Coordinator:	**Dr. Mohamed Farouk Abdelkader**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Date: 10/2020

ECE 506
Active Circuits
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Active circuits	**Code Symbol: ECE 506**	
Lecture	**3 Hours**	
Tutorial / Laboratory	**-**	
Total	**3 Hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the students with the basic concepts and characteristics of the active circuits and the principles of circuit analysis and design. This course is designed to extend the basic concepts learned in electrical circuits and electronic circuits. The course is meant to create the background needed to understand the Active circuits operations. General active circuits and filters will be taught in the context of technological applications. Emphasis will be on controlled source realization, op-amps circuits and filters.

2- Course Objectives:

The main Objectives of this course are to equip the students with:

1. Discuss the advanced concepts, principles and techniques relevant to active circuits.
2. Solve problems related to active circuits.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using active circuits.
4. Apply the basics and the methodologies of scientific research using its different tools in the area of active circuits.
5. Apply specialized knowledge on relevant knowledge in his / her professional practice in the area of active circuits.

3- Intended Learning Outcomes (ILOs):

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the	a1-2-1 Classify the active circuits according to

concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	their structure and properties. a1-2-2 Recognize the Controlled Source Realizations a1-2-3 Discuss the Operational Amplifiers and Linear Circuit Application a1-2-4 Explain the basics differences between filter types
A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	a2-1-1 Recognize the professional aspects of active circuits applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to active circuits and its application paradigms.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to active circuits.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to active circuits
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to active circuits problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write a professional report on digital filters.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about active circuits types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about active circuits.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- RC-Active Circuits	12	12	--
2- Controlled Source Realizations	12	12	--
3- Analysis of Active Circuits	12	12	--
4- Operational Amplifiers and Linear Circuit Application	12	12	
5- Circuit Decomposition, Structures, and Sensitivity	6	6	--
6- Filter Synthesis and Design	12	12	--
7- Switching Capacitor Filters	6	6	--
8- Digital Wave Filters.	12	12	--
Total	84	84	--

Relationship between the course and the program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2 -1, A3-1	B1-1, B3-1,	C1-1, C2-1	D5-1 , D8-1

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

6- Course Topics.

Topic No.	Topic	Weeks
1st	RC-Active Circuits and Controlled Source Realizations	1-8
2nd	Analysis of Active Circuits	9-12
3rd	Operational Amplifiers and Linear Circuit Application	13-16
4th	Circuit Decomposition, Structures, and Sensitivity	17 - 18
5th	Filters (Switching Capacitor and digital Filters) Synthesis and Design	19-28

7- ILOs Matrix Topics

Course ILOs	Course topics				
	1st	2nd	3rd	4th	5th

a1-2-1 Classify the active circuits according to their structure and properties.	X	X		X	
a1-2-2 Recognize the Controlled Source Realizations	X				
a1-2-3 Discuss the Operational Amplifiers and Linear Circuit Application			X		
a1-2-4 Explain the basics differences between filter types					X
a2-1-1 Recognize the professional aspects of active circuits applications and their effects on the Environment.	X	X	X		
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to active circuits and its application paradigms.		X	X		X
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to active circuits.		X	X		X
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to active circuits		X		X	X
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to active circuits problems, using latest engineering techniques, skills, and tools.		X		X	
c2-1-1 Write a professional report on digital filters.					X
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about active circuits types and technology.	X		X	X	
d8-1-1 Exhibit the ability to learn more about active circuits.	X	X			X

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a2-1-1	x		x		x			x					
	a3-1-1	x		x					x					

Intellectual Skills	b1-1-1					x								
	b3-1-1					x								
Professional Skills	c1-1-1					x								
	c2-1-1		x	x					x	x				
	d5-1-1		x						x	x				
	d8-1-1		x						x	x				

9- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- S. A. Pactitis "Active filters", CRC press, 2011.
- William Rynone "Linear Active circuits ", Artech house, 1986.

12- <u>Program Coordination Committee:</u>

Course Coordinator:	**Assistant Prof. Dr. Saly Saad Hassaneen**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 507
Advanced
TV Technology
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Advanced TV Technology	**Code Symbol: ECE 507**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims at providing students with advanced knowledge and understanding of TV technology; understanding of Comb Filters and Separation of Chrominance and Luminance circuits. Also, it provides studding Transcoders, Techniques for Bit Rate Reduction, Digital Coding and Digital TV Techniques.

2- Course Objectives:

The main Objectives of this course are to provide students with:

1. Gain knowledge aboutTV technology
2. Construct advanced skills in the definition, analysis, and solving problems.
3. Identify and design Comb Filters and Separation of Chrominance and Luminance circuits
4. Revise techniques for bit rate reduction, digital coding and digital TV .

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics appropriate TV technologyanalysis and design.

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize different blocks in TV technology and the theory behind their operation a1-2-2 Explain basic facts & theories in the field of TV technology
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Discuss social effects of TV technology
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related toTV technology
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to TV technology.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to TV technology.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to TV technology, using computer simulation tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write a professional report on modern TV technologies.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about TV technology

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
Introduction toTV technology	12	12	--
design Comb Filters	12	12	--
Separation of Chrominance and Luminance circuits	12	12	--
Transcoders circuits	12	12	--
methods for bit rate reduction	12	12	--
digital coding	12	12	--
digital TV techniques	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1, A1-2, A2 - 1, A3-1	B1-1, B2-1,	C1-1, C2-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	**70%**	**30%**	**-**	**-**		**100%**

7- Course Topics

Topic No.	Topic	Weeks
1st	Introduction toTV technology	**1-4**
2nd	design Comb Filters and Separation of Chrominance and Luminance circuits	**5-12**
3rd	Transcoders circuits	**13-16**
4th	methods for bit rate reduction	**17-20**
5th	digital coding and digital TV techniques	**21-28**

8- ILOs Matrix Topics

Course topics	Course topics				
	1st	2nd	3rd	4th	5th
a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics appropriate TV technologyanalysis and design.	X	X	X	X	
a1-2-1 Recognize different blocks in TV technology and the theory behind their operation		X	X	X	
a1-2-2 Explain basic facts & theories in the field of TV technology	X				X
a2-1-1 Report and discuss social effects of TV technology					X
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related toTV technology			X		X
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to TV technology.			X		X
b2-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to TV technology.		X		X	
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to TV technology, using computer simulation tools.			X	X	X
c2-1-1 Write a professional report on modern TV technologies.					X
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about TV technology			X	X	X

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge	a1-1-1	x		x	x	x								

&understanding	a1-2-1	x		x	x	x								
	a2-1-1	x		x	x	x								
	a3-1-1	x		x	x	x								
Intellectual Skills	b1-1-1		x											
	b2-1-1		x			X								
Professional Skills	c1-1-1					x					x			
	c2-1-1		x	x					x	x				
	d5-1-1			x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

Lectures and Labs notes are provided.

Essential Books (Text Books):

Walter Fischer, "Digital Television," Springer, 2004
Peter Ward, "TV technical operation," CRC Press, 2000.

12- Program Coordination Committee:

Course Coordinator: **Dr. Saly Saad Hassaneen**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 508
Advanced Electronic Measurements
Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Advanced ElectronicMeasurements	**Code Symbol: ECE 508**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts for the electronic measurements. This course provides the postgraduate students with the necessary analytical study, practical and professional skills concerning the course of undergraduate program. The extended course is content upon a set of advanced on electronic measurements. Also, this course provides the background relating to the manufacturing and characterization techniquesof some types of measurement devices help students to meet the demand of growing electronic industry and prepares them to advanced study and research in the electronic devices and to be familiar with recent trends in electronics measurements. The students will gain sufficient background to deal with advanced electronic instrumentation, and to properly carry out measurements employing these instruments. The practical experience will come from the lab work, analysis and write up of the lab measurements.

2- Course Objectives:

The main Objectives of this course are to:

1. Revise advanced electronic measurements facts, concepts, principles, techniques and measuring instruments.
2. Conduct measurements for different semiconductor devicesand electronic systems.
3. Review tools, techniques, equipment and software relevant to electronic measurements and how to use them efficiently.
4. Develop methods and use techniques, principles and laws of engineering science to present, evaluate, and interpret experimental data concern with electronic measurements, instrumentation, to develop lines of argument and make sound judgments in accordance with their basic theories and concepts.
5. Identify and categorize the experimental electronic components to be built, constructs them on breadboard, and performs the experiment.
6. Apply of the basics and the methodologies of scientific research and the use of its different tools in the area of electronic measurements and instrumentation.
7. Collect specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of electronic measurements.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning**

Outcomes (ILOs):

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basics of Electronic Instruments. a1-2-2 Classify the basic concepts for the measurement of Sensors and Transducers. a1-2-3 Describe different effective techniques and methods of Magnetic Measurements. a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding for Signal Generators and Analyzers. a1-2-5 Demonstrate sufficient essential knowledge and a deep understanding of Data Acquisition System. a1-2-6 Explain the Recording, Storage and Display Devices. a1-2-7 Explain and describe the most common Microwave and RF measurements.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1Write new advances in analysis and design methodologies in Electronics and Communications measurements techniques.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of Electronics and Communications systems measurements techniques phases.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1discuss the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to advanced electronic measurements.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientificproblems..	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve practical problems related to Electronic Measurements.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering..	b5-1-1 Evaluate pros and cons of given methodologies for Electronics and Communications systems measurements.

C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, developing plans and creating engineering solutions related to Electronics and Communications systems measurement problems, using latest engineering techniques, skills, and tools.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1Perform effectively with the skills that necessary to identify, design, analysis and categorize the experimental electronic components to be built, constructs them on breadboard, and performs the experiment. c1-2-2Performeffectively with the skills that necessary to Use tools, techniques, and equipment relevant to Microwave and RF Measurements.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on advanced measurement techniques for Microwave and RF.
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	c3-1-1 Evaluate measurements methods, techniques and tools reported in this course.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about Electronics and Communications systems measurements techniques.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency..	d8-1-1Exhibit the ability to learn more about Electronics and Communications systems measurements.

4- Course Contents

Lecture Topic (The lecture willbedone Inside the Lab)	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Basic Concepts of Electronic Instruments.	15	15	--
2- Measurement of Sensors and Transducers.	12	12	--
3- Techniques and methods of Magnetic Measurements.	9	9	--
4- Signal Generators and Analyzers.	6	6	
5- Data Acquisition System.	9	9	

6-Recording, Storage and Display Devices.	9	9	
6- Microwave and RF measurements	24	24	
Total	84	84	**--**

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A3-1, A5-1	B1-1, B3-1, B5-1	C1-1, C1-2, C2-1, C3-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**-**	**30**	**-**	**70**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Basic Concepts of Electronic Instruments.	**1-5**
2nd	Measurement of Sensors and Transducers.	**6-9**
3rd	Techniques and methods of Magnetic Measurements.	**10-12**
4th	Signal Generators and Analyzers.	**13-14**
5th	Data Acquisition System.	**15-17**
6th	Recording, Storage and Display Devices	**18-20**
7th	Microwave and RF measurements	**21-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basics of Electronic Instruments.	x						
a1-2-2 Classify the basic concepts for the measurement of Sensors and Transducers.	x						
a1-2-3 Describe different effective techniques and methods of Magnetic Measurements.		x					
a1-2-4 Demonstrate sufficient essential knowledge			x				

and a deep understanding for Signal Generators and Analyzers.							
a1-2-5 Demonstrate sufficient essential knowledge and a deep understanding of Data Acquisition System.				x			
a1-2-6 Explain and describe the Recording, Storage and Display Devices.					x		
a1-2-7 Explain the most common Microwave and RF measurements.					x		
a3-1-1Write new advances in analysis and design methodologies in Electronics and Communications measurements techniques.						x	x
a5-1-1 Explain quality assurance concepts of Electronics and Communications systems measurements techniques phases.						x	x
Course ILOs	**Intellectual Skills**						
b1-1-1Discuss the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to**Advanced Electronic Measurements.**						x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve practical problems related to Electronic Measurements.						x	x
b5-1-1 Evaluate pros and cons of given methodologies for Electronics and Communications systems measurements.	x	x	x	x			
Course ILOs	**Professional Skill**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, developing plans and creating engineering solutions related to Electronics and Communications systems measurement problems, using latest engineering techniques, skills, and tools.						x	x
c1-2-1Performeffectively with the skills that necessary to identify, design, analysis and categorize the experimental electronic components to be built, constructs them on breadboard, and performs the experiment.						x	x
c1-2-2Performeffectively with the skills that necessary to Use tools, techniques, and equipment relevant to Microwave and RF Measurements						x	x
c2-1-1 Write and evaluate a professional report on advanced measurement techniques for Microwave and RF.						x	x
c3-1-1 Evaluate measurements methods, techniques and tools reported in this course.	x	x	x	x	x	x	x
Course ILOs	**General Skills**						

D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.		x	x	x	x	x	x
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency..		x	x	x	x	x	x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method (The teching process will be done inside the Lab)**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								x
	a1-2-2	x				x								x
	a1-2-3	x				x								x
	a1-2-4	x				x								x
	a1-2-5	x				x								x
	a1-2-6	x				x								x
	a1-2-7	x				x								x
	a3-1-1			x					x	x				
	a5-1-1			x					x	x				
	b1-1-1					x								x
	b3-1-1					x								
	b5-1-1			x		x			x					
Professional Skills	c1-1-1					x								x
	c1-2-1								x					x
	c1-2-2								x					x
	c2-1-1		x	x					x					
	c3-1-1		x	x					x					x
	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment
10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector –Optical Measurement Practical Lab - Library.

A. laboratory Usage (During Lectures):

The teaching process will be done inside the Lab and the professor and the students are expected to prepare and conduct some practical experiments.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Book (Text Books):

- Prithwiraj Purkait, Budhaditya Biswasand,Santanu Das and Chiranjib Koley "Electrical and Electronics Measurementsand Instrumentation", McGraw Hill Education, 2013.

Recommended Book:

- David A Bell "Electronic Instrumentation and Measurements" ,OXFORD UNIVERSITY PRESS (RS); 3rd edition (2013)

13- Program Coordination Committee:

Course Coordinator: **Assistant Prof. Dr. Islam Elsayed Shaalan**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 509

Communication Electronics

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Communication Electronics	**Code Symbol: ECE 509**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course aims at providing students with the basic knowledge and understanding of communication electronics including the basic building blocks of communication systems. This course will also provide students with the ability to analyze and design of radio frequency circuits such as analog modulation circuits, IC oscillators, function generators, active filters, switched capacitor filter PLL and frequency synthesizers, pulse modulation circuits and multiplexers. Also, it provides an introduction to data communication.

2- Course Objectives:

The main Objectives of this course are to provide students with:

1. Discuss communication electronics systems.
2. develop blocks of communication systems.
3. Explain communication electronics systems such as modulators, oscillators, synthesizers and mixers.
4. simulate communication electronics systems.
5. Apply specialized knowledge and combining it with relevant knowledge in data communication systems.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	

A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize different communication electronics and understand the their operation. a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of communication electronics systems to develop his/her professional research practice in dealing with this systems.. a1-2-3 Discuss the different communication blocks a1-2-4 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of data communications field.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to communication electronics systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to communication electronic.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze and manipulate data from a variety of sources and relate it to suggest solutions to communication electronics problems.
C. Professional and practical skills	
C1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a computational tools including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in communication electronic systems.
C2-1 Write and evaluate a professional report on specialized related to electronics and communications technical matters.	c2-1-1 Write a professional technical report pertaining to communications electronics
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in	d2-1-1 Use state-of-the-art computer aided design

such a way that serves in the development of him/ her professional practice and research.	tools for simulation of communication electronics systems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about communication electronics systems.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Analog Modulation Circuits.	6	6	--
2- IC Oscillators	12	12	--
3- Function Generators	12	12	--
4- Active Filters and Switched Capacitor Filter	18	18	
5- PLL and Frequency Synthesizers	12	12	--
6- Pulse Modulation Circuits and Multiplexers	12	12	--
7- Introduction Data Communication	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	Academic Reference Standard(ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A3-1	B1-1, B3-1	C1-1, C1-2, C2-1	D2-1, D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**40%**	**60%**	**-**	**-**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Analog Modulation Circuits including: modulators, oscillators and function generators.	**1-10**
2nd	Filters (Active and Switched Capacitor Filter)	**11-16**

3rd	PLL and Frequency Synthesizers	**17-20**
4th	Pulse Modulation Circuits and Multiplexers	**21-24**
5th	Introduction Data Communication	**25-28**

8- ILOs Matrix Topics

Course ILOs	Course topics				
	1st	**2nd**	**3rd**	**4th**	**5th**
a1-2-1 Recognize different communication electronics and understand the their operation.	X	X	X	X	
a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of communication electronics systems to develop his/her professional research practice in dealing with this systems..		X		X	
a1-2-3 Discuss the different communication blocks	X		X		
a1-2-4 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of data communications field.					X
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to communication electronics systems.	X	X	X	X	
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to communication electronic.	X		X	X	
b3-1-1 Analyze and manipulate data from a variety of sources and relate it to suggest solutions to communication electronics problems.		X		X	
c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.					X
c1-2-1 Use a computational tools including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in communication electronic systems.			X	X	
c2-1-1 Write a professional technical report pertaining to communications electronics				X	
d2-1-1 Use state-of-the-art computer aided design tools for simulation of communication electronics systems.	X		X		
d5-1-1 Use different sources of information like	X	X		X	

library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about communication electronics systems.					

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x												
	a1-2-2	x												
	a1-2-3	x												
	a1-2-4	x												
	a3-1-1	x												
Intellectual Skills	b1-1-1			x		x								
	b3-1-1			x		x								
Professional Skills	c1-1-1					x								
	c1-2-1					x							x	
	c2-1-1		x	x		x			x					
General Skills	d2-1-1												x	
	d5-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments during the lectures at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

Lecture notes are provided.

Essential Books (Text Books):

1. S. Sedra and K. C. Smith, "Microelectronic Circuits," Oxford, Seventh Edition, New York, 2015.
2. B. Razavi, "RF Microelectronics," Second Edition, Prentice-Hall, New York, 2012.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Saly S. Hassaneen**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 510
Industrial Electronics
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Industrial Electronics	**Code Symbol: ECE510**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in electronics engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in electronics engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of industrial electronic systems engineering. The course is meant to create the deep understanding of the physics behind the use of electronic systems in industrial applications. The course is meant also to enhance the ability of the student to integrate the proper electronic elements in various industrial systems. Emphasis will be on the recent industrial systems and advanced methods of analysis and synthesis.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain the knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to industrial electronics engineering.
2. Analyze and solve problems related to industrial electronic systems.
3. Develop models and methods and use techniques, principles and laws of electronic engineering in order to lead to industrial engineering applications.
4. Review classical and modern methods to identify/solve complex and open ended industrial engineering problems related to electronic systems.
5. Identify current problems and find solutions for it using electronic circuits and systems in the area of industrial systems and applications.
6. Apply the basics and the methodologies of scientific research and the use of its different tools in the area of industrial electronics.
7. Construct specialized knowledge and combining it with relevant knowledge in his / her professional practice in the area of industrial electronics.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize the different industrial electronic components. a1-2-2 Recognize the power generators suitable for industrial applications. a1-2-3 Classify the industrial electronic timers. a1-2-4 Discuss the main methods of analysis and design of industrial electronic circuits.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to industrial electronic systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the automatic testing and troubleshooting scenarios.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to industrial speed control systems.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to programmable logic controllers for industrial applications, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on integrated sensors systems.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about industrial electronic systems types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about industrial electronic systems.

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**
1. Industrial electronic components and power generators.	6	6	-	--
2. Industrial electronic timers.	6	6	-	--
3. Industrial rectifier circuits	9	9	-	--
4. Electronic motor control and speed control systems.	9	9	-	--
5. Industrial control systems.	9	9	-	--
6. Industrial data manipulation.	9	9	-	--
7. Programmable logic controllers.	9	9	-	--
8. Automatic testing and troubleshooting.	9	9	-	--
9. Sensors and Integrated sensor systems.	9	9	-	--
10. Electronic apparatus for special purposes.	9	9	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A3-1	B1-1, B3-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**20%**	**80%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Industrial electronic components and power generators.	1-2
2nd	Industrial electronic timers.	3-4
3rd	Industrial rectifier circuits	5-7
4th	Electronic motor control and speed control systems.	8-10
5th	Industrial control systems.	11-13

6th	Industrial data manipulation.	14-16
7th	Programmable logic controllers.	17-19
8th	Automatic testing and troubleshooting.	20-22
9th	Sensors and Integrated sensor systems.	23-25
10th	Electronic apparatus for special purposes.	26-28

8- ILOs Matrix Topics

Course ILOs	Course topics									
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**
a1-2-1 Recognize the different industrial electronic components.	x	x					x		x	x
a1-2-2 Recognize the power generators suitable for industrial applications.	x	x			x		x		x	x
a1-2-3 Classify the industrial electronic timers.	x		x	x		x	x	x	x	x
a1-2-4 Discuss the main methods of analysis and design of industrial electronic circuits.	x	x	x	x	x	x	x	x	x	x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to industrial electronic systems..			x	x		x			x	x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the automatic testing and troubleshooting scenarios.	x	x	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to industrial speed control systems.			x	x	x	x		x		
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to programmable logic controllers for industrial applications, using latest engineering techniques, skills, and tools.			x	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on integrated sensors systems.										x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about industrial electronic systems types and			x			x	x	x	x	

technology.										
d8-1-1 Exhibit the ability to learn more about industrial electronic systems.	x		x	x	x		x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. D. J. Shanefield, ”Industrial Electronics with optional Lab experiments,” Noyes Publications, 2001.

2. R. Kretzmann, ” Industrial Electronics Handbook,” Philips Technical Library, 1964.

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Hebs Youssef Soliman**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Rizq**

Updated Date: 10/2020.

ECE 511
Biomedical Electronics
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Biomedical Electronics	**Code Symbol: ECE511**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in electronics engineering applications. For those students who look toward an industrial position after graduation, this course is designed to widen background in biomedical electronics and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of biomedical engineering. The course is meant to create the deep understanding of the physics behind the phenomena of electrical signals, ultrasound and radiation. The course is meant also to enhance the ability of the student to integrate the proper phenomena in various biomedical electronic systems. Emphasis will be on the advanced methods of analysis and synthesis.

2- Course Objectives:

The main Objectives of this course are to:

1. Collect advanced facts, theories, concepts, principles and techniques relevant to biomedical electronics.
2. Analyze and solve problems related to biomedical electronic systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to biomedical electronic engineering applications.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to biomedical applications.
5. Apply the basics and the methodologies of scientific research and the use of its different tools in the area of biomedical electronics.
6. Build specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of biomedical electronics.

3- Intended Learning Outcomes (ILOs)

Program ILOs	**Course ILOs**
A. Knowledge and understanding	

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize the important related information of Anatomy. a1-2-2 Recognize the radiation and radiation absorption phenomena. a1-2-3 Classify the conductivity and insulation properties of materials.. a1-2-4 Discuss the main methods of data and multi-signal processing.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related tobiomedical electronics.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the multi-signal processing tasks.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to detection of signals.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to biomedical electronics problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on integrated biomedical electronic systems.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about biomedical electronic engineering and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about biomedical engineering.

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**

1. Introduction to Anatomy.	6	6	-	--
2. Electrical conductivity and insulation.	6	6	-	--
3. The nature and physics of radiation absorption.	9	9	-	--
4. Applications of Radiation in medecine.	9	9	-	--
5. Nature and Physics of Ultrasound.	9	9	-	--
6. Applications of Ultrasound in medicine.	9	9	-	--
7. Detection and generation of Ultrasound.	9	9	-	--
8. Linear signal processing.	9	9	-	--
9. Multisignal processing.	9	9	-	--
10. Data boards.	9	9	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2, A3-1	B1-1, B3-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Discretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to Anatomy.	1-2
2nd	Electrical conductivity and insulation.	3-4
3rd	The nature and physics of radiation absorption.	5-7
4th	Applications of Radiation in medicine.	8-10
5th	Nature and Physics of Ultrasound.	11-13
6th	Applications of Ultrasound in medicine.	14-16
7th	Detection and generation of Ultrasound.	17-19
8th	Linear signal processing.	20-22
9th	Multi-signal processing.	23-25
10th	Data boards.	26-28

8- ILOs Matrix Topics

Course ILOs	Course topics									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
a1-2-1 Recognize the important related information of Anatomy.	x	x					x		x	x
a1-2-2 Recognize the radiation and radiation absorption phenomena.	x	x			x		x		x	x
a1-2-3 Classify the conductivity and insulation properties of materials.	x		x	x		x	x	x	x	x
a1-2-4 Discuss the main methods of data and multi-signal processing.	x	x	x	x	x	x	x	x	x	x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to biomedical electronics.			x	x		x			x	x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the multi-signal processing tasks.	x	x	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to detection of signals.			x	x	x	x		x		
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to biomedical electronics problems, using latest engineering techniques, skills, and tools.			x	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on integrated biomedical electronic systems.										x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about biomedical electronic engineering and technology.			x			x	x	x	x	
d8-1-1 Exhibit the ability to learn more about biomedical engineering.	x		x	x	x		x	x	x	x

9- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

<u>12- List of references:</u>

1. D. Jennings, "Introduction to medical electronics applications," Edward Arnolds Publishing, 1995.
2. **J. Enderle, J, Bronzino, and S. Blanchard, "Introduction to Biomedical Engineering," 2005.**

13- <u>Program Coordination Committee:</u>

Course Coordinator: **Associate Prof. Dr. Heba Youssef Soliman**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Rizq**

Updated Date: 10/2020.

ECE 512
Microprocessor and Interfacing Circuits Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electronics and Communications Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	***2020***

A- Basic Information

Title: Microprocessor and interfacing circuits	**Code Symbol**: **ECE 512**	
Lecture	3 hours	
Tutorial / Laboratory	**-**	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course provides an in-depth exploration of hardware/software interfacing for microprocessor-based systems, including microcontrollers, with the aim of imparting sufficient knowledge to enable students to design and implement systems of their own, particularly for embedded applications. The philosophy of the course is to progress from low-level internal interconnections and input/output interfaces, through software issues and interrupt processing, to high-level considerations for embedded and system-on-chip applications. In this manner, the course seeks to develop an appreciation of attention to technical details while also maintaining an overall system perspective. Laboratory activity provides opportunities for practical application of the hardware and software concepts. Technical case studies are also employed to illustrate the application of the relevant concepts. This course builds on and supplements knowledge from other courses on digital logic, computer architecture, circuits and electronics, and software/programming.

2- Course Objectives:

- Explore hardware/software interfacing for microprocessors.
- Design and implement microprocessor-based systems.
- Develop an appreciation of attention to technical details while also maintaining an overall system perspective.
- Provide opportunities for practical application of the hardware and software concepts.

3- Intended Learning Outcomes (ILOs) forthewholeprogram

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1- Basic facts & theories in the field of electronics and communications, and interrelated fields.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Discuss the application of interfacing and embedded-system concepts as exemplified by representative systems a1-1-2 Explain microcontroller architectures and implementations, system-on-chip design in field-programmable logic chips, and related design considerations for embedded applications.
A3- Main scientific advances in the field of electronics and communications.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Discuss bus and memory interface timing and how it relates to cycle-by-cycle processor operation
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Design and implement logic for parallel input/output ports.
B2- Solve specific problems on the basis of limited and contradictory information. .	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Design and implement software in assembly language and in the C language for interrupt-capable hardware interfaces such as parallel ports and timers.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in	C1-1 Apply knowledge of mathematics, science, information technology,	c1-1-1 Apply knowledge of software engineering, microcontroller development, numerical modeling,

the field of specialization.	design, numerical modeling, modern, and principle of professional skills to solve engineering problems	modern, and principle of professional skills to design microprocessor software.
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided simulation tools for solving professional problems related to microprocessor
D5- Use different sources of information to obtain data.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microprocessor and interfacing circuits

4- Course Contents

Lecture Topic	**Total Hours**	**Lecture Hours**	**Practical/Tutorial Hours**
1- Review of computer organization concepts, bus interconnection	**12**	**12**	--
2- Memory, address decoding, parallel port interfaces for memory-mapped input/output	18	18	--
3- Interrupts and exceptions and its applications	**18**	**18**	--
4- Embedded system concepts and design considerations	**18**	**18**	--
5- Microcontroller chip architecture, representative microcontroller implementations, examples of sensors and actuators for interfacing	18	18	--
Total	**84**	**84**	**--**

5- Relationshipbetweenthecourseandtheprogram

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	(A1-1), (A3-1)	(B1-1), (B2-1)	(C1-1)	(D2-1), (D5-1)

6- Course Subject Area:

A	B	C	D	E	F	

HumanitiesandSocial Science	Mathematicsand Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applicationsand ICT	Projects andpractice	Disccret
---	---	20%	60%	-	20%	

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Review of computer organization concepts, bus interconnection	1-4
2nd	2- Memory, address decoding, parallel port interfaces for memory-mapped input/output	5-10
3rd	3- Interrupts and exceptions and its applications	11-16
4th	4- Embedded system concepts and design considerations	17-22
5th	5- Microcontroller chip architecture, representative microcontroller implementations, examples of sensors and	23-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**
Course ILOs	**Knowledge & Understanding**				
a1-1-1 Discuss the application of interfacing and embedded-system concepts as exemplified by representative systems	x		x		x
a1-1-2 Explain microcontroller architectures and implementations, system-on-chip design in field-programmable logic chips, and related design considerations for embedded applications.	x		x	x	x
a3-1-1 Discuss bus and memory interface timing and how it relates to cycle-by-cycle processor operation		x	x		
Course ILOs	**Intellectual Skills**				
b1-1-1 Design and implement logic for parallel input/output ports.			x	x	x
b2-1-1 Design and implement software		x	x	x	x

in assembly language and in the C language for interrupt-capable hardware interfaces such as parallel ports and timers.					
Course ILOs	**Professional Skill**				
c1-1-1 Apply knowledge of software engineering, microcontroller development, numerical modeling, modern, and principle of professional skills to design microprocessor software.	x	x	x	x	x
Course ILOs	General Skills				
d2-1-1 Use state-of-the-art computer aided simulation tools for solving professional problems related to microprocessor		x	x	x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microprocessor and interfacing circuits	x	x	x	x	x

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ **online sessions**	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x			x	x		x						
	a1-1-2	x			x	x		x						
	a3-3-1	x			x	x		x						
Intellectual Skills	b1-1-1				x	x		x						
	b2-1-1				x	x		x						
Professional Skills	c1-1-1				x	x		x						
General Skills	d2-1-1							x					x	
	d5-1-1		x					x		x				
								x						
								x						
								x						
								x						
								x						

9- Assessment

9.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilitiesrequiredforteachingandlearning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Microprocessor development boards - Library.

A. laboratoryUsage:

Students are expected to design, and develop microcontroller software code using the available development boards and SDK.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Hamacher, Z. Vranesic, S. Zaky, and N. Manjikian, Computer Organizationand Embedded Systems, 6th edition, McGraw-Hill, 2012.

12- ProgramCoordinationCommittee:

Course Coordinator: **Dr. Mohamed Farouk Abdelkader**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Rizk**

Date: 10/2020

ECE 513

Integrated Circuits Technology

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Integrated CircuitsTechnology	**Code Symbol: ECE 513**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims to introduce the essential processes in integrated-circuits fabrication. The student must be acquainted with the processes of crystal growth, silicon wafer ,preparation, contamination control, oxidation, advanced photolithography processes, doping, layer deposition, metallization, process, and packaging.

2- Course Objectives:

The main objectives of this course are to:

1. Gain knowledge and understanding of basic commands related to main steps in integrated-circuits fabrication.
2. Collect skills in the fabrication of integrated circuits.
3. Establish a typical fabricated chip.
4. Apply fabrication steps in a typical integrated circuit.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the different processes in integrated-circuit fabrication. a1-2-2 Demonstrate the various fabrication processes. a1-2-3 Describe different types of microchips. a1-2-4 Explain the various fabrication processes. a1-2-5 Classify the various processes.

A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	a2-1-1 Report and discuss social effects of integrated-circuits fabrication.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the applications of systems-on-chip.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of fabrication.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to integrated-circuits fabrication.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 identify and apply appropriate methods for integrated-circuits fabrication.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of foundries.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of different types of fabrication.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to fabrication.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on integrated-circuits fabrication.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about

knowledge.	integrated-circuits technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about fabrication.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1. The semiconductor industry.	12	12	--
2. Crystal growth and silicon wafer preparation.	6	6	--
3. Contamination control.	6	6	--
4. Productivity and process yields.	6	6	--
5. Oxidation.	6	6	--
6. Doping.	6	6	--
7. Layer depositionand metalization.	12	12	--
8. Process and device evaluation.	6	6	--
9. Introduction to device and integrated circuit formation.	6	6	--
10. Introduction to integrated circuits.	6	6	--
11. Packaging.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B2-1, B3-1, B5-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	60%	10%	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1. The semiconductor industry.	**1-4**
2nd	2. Crystal growth and silicon wafer preparation.	**5-6**
3rd	3. Contamination control.	**7-8**

4th	4. Productivity and process yields.	**9-10**
5th	5. Oxidation.	**11-12**
6th	6. Doping.	**13-14**
7th	7. Layer depositionand metalization.	**15-18**
8th	8. Process and device evaluation.	**19-20**
9th	9. Introduction to device and integrated circuit formation.	**21-22**
10th	10. Introduction to integrated circuits.	**23-24**
11th	11. Packaging.	**25-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**	**11th**
Course ILOs	**Knowledge & Understanding**										
a1-2-1 Classify the different processes in integrated-circuit fabrication. a1-2-2 Demonstrate the various fabrication processes. a1-2-3 Describe different types of microchips. a1-2-4 Explain the various fabrication processes. a1-2-5 Classify the various processes.	x	x	x								
a2-1-1 Report and discuss social effects of integrated-circuits fabrication.	x	x	x								
a3-1-1 Classify the applications of systems-on-chip.				x		x		x			
a5-1-1 Explain quality assurance concepts of fabrication.					x						
Course ILOs	**Intellectual Skills**										

b1-1-1 Demonstrate an investigatory and analytic thinking approach (problem solving) to solve problems related to integrated-circuits fabrication.	x	x	x	x	x	x	x	x	x	x	x
b2-1-1 identify and apply appropriate methods for integrated-circuits fabrication.				x		x		x			
b3-1-1 Analyze, interpret and manipulate data from a variety of foundries.				x		x		x			
b5-1-1 Evaluate pros and cons of different types of fabrication.				x		x		x			
Course ILOs	**Professional Skill**										
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to fabrication.				x		x		x			
c2-1-1 Write and evaluate a professional report on integrated-circuits fabrication.											x
Course ILOs	General Skills										
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about integrated-circuits technology.									x	x	
d8-1-1 Exhibit the ability to learn more about fabrication.											x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**													
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-4-1	x			x	x								
	a1-4-2	x			x	x								
	a1-4-3	x			x	x								
	a1-4-4	x			x	x								

	a1-4-5	x			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1									x		x		
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1				x	x				x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

1. R. S. Muller, T.I. Kamins, and M. Chan,Device Electronics for Integrated Circuits,3rd ed.,Hoboken, NJ, John Wiley & Sons, 2003.
2. J. D. Plummer, M.D. Deal, and P.B. Griffin,Silicon VLSI Technology, Upper Saddle River,NJ, Prentice Hall, 2000.
3. S. Wolf,Microchip Manufacturing, Lattice Press (www.latticepress.com), 2004.

13- Program Coordination Committee:

Course Coordinator: **Associate Prof. Dr. Sherif M. Sharroush**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Rizq**

Updated Date: 10/2020

Quality Assurance & Accreditation Unit

ECE 514
Digital Control Principles
Course Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electronics and Communications Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	***2019***

A- Basic Information

Title:Digital Control Principles	**Code Symbol**: **ECE 514**	
Lecture	3 hours	
Tutorial / Laboratory	**-**	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in digital control theory. For those students who look toward an industrial position after graduation, this course is designed to widen background in control engineering and help them to meet the industry demand. The student shall attain the above mentioned aims efficiently under controlled guidance and supervision. The course will involve the design, analysis, simulation, and evaluation of a digital linear and non-linear controller. The students will gain familiarity with sampling and quantization, z-transform, and other analysis tools that are used to analyze and design digital control systems; familiarity with the state space and input/output representation, modeling and analysis of digital control systems; familiarity with modern control design methodologies for continuous-time and discrete-time systems that may include but not limited to: state feedback control, state observer design, observer based compensator design.

2- Course objectives:

- Extend basic concepts learned in digital control theory.
- Gain a background in control engineering.
- Review sampling and quantization, z-transform, and other analysis tools that are used to analyze and design digital control systems.
- Model and analyze of digital control systems.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	**Program ILOs**	**Course ILOs**

A. Knowledge and understanding		
A1- Basic facts & theories in the field of electronics and communications, and interrelated fields.	A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Explain the z-transform and state space theories and their use in digital control theory . a1-1-2 Discuss the advantages of digital filters
A3- Main scientific advances in the field of electronics and communications.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-3-1 Classify the Potential applications of digital controls systems in advanced electronics and communication systems.
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Report and discuss effects of quantization errors on digital control systems
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to digital control system design and evaluation.
B2- Solve specific problems on the basis of limited and contradictory information. .	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Apply broad knowledge of modern control theory and their computation methods and use it to design digital control systems.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling,	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of

specialization.	modern, and principle of professional skills to solve engineering problems	professional skills to solve control system design.
C2- Write and appraise reports	C2-1 Write and evaluate a professional report on specialized related to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on non-linear control systems.
D. General and transferrable skills		
D2- Demonstrate efficient IT capabilities in such a way that serves in the development of the professional practice.	D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided simulation tools for solving professional problems related to digital control.
D5- Use different sources of information to obtain data.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital control systems

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical/Tutorial Hours
1- Review digital control systems	**12**	**12**	--
2- Discrete time systems and the z-transform	18	18	--
3- Sampling and Reconstruction	**18**	**18**	--
4- State variables in discrete time systems.	**18**	**18**	--
5- Digital controller design	18	18	--
Total	**84**	**84**	**--**

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	(A1-1), (A3-1), (A5-1)	(B1-1), (B2-1)	(C1-1), (C2-1)	(D2-1), (D5-1)

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total

---	10%	40%	50%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Review digital control systems	1-4
2nd	Discrete time systems and the z-transform	5-10
3rd	Sampling and Reconstruction	11-16
4th	State variables in discrete time systems.	17-22
5th	Digital controller design	23-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**
Course ILOs	**Knowledge & Understanding**				
a1-1-1 Explain the z-transform and state space theories and their use in digital control theory .		x		x	
a1-1-2 Discuss the advantages of digital filters	x	x			
a3-1-1 Classify the Potential applications of digital controls systems in advanced electronics and communication systems.	x				x
a5-1-1 Report and discuss effects of quantization errors on digital control systems			x		x
Course ILOs	**Intellectual Skills**				
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to digital control system design and evaluation.	x	x	x	x	x
b2-1-1 Apply broad knowledge of modern control theory and their computation methods and use it to design digital control systems.				x	x
Course ILOs	**Professional Skill**				
c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical	x	x	x	x	x

modeling, modern, and principle of professional skills to solve control system design.					
c2-1-1 Write and evaluate a professional report on non-linear control systems.					x
Course ILOs	General Skills				
d2-1-1 Use state-of-the-art computer aided simulation tools for solving professional problems related to digital control.					x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital control systems	x	x	x	x	x

8- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ **onl online sessions**	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x			x	x								
	a1-1-2	x			x	x								
	a3-1-1	x			x	x								
	a5-1-1	x			x	x								
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x	x				
General Skills	d2-1-1												x	
	d5-1-1		x							x				

9- <u>Assessment</u>

9.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage:

Students are expected to prepare and conduct some control system simulation assignments using MATLAB simulators using general computer labs.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Digital Control System Analysis and Design, by C. L. Phillips, H. T. Nagle: 4th Edition. 2015

12- Program Coordination Committee:

Course Coordinator:	**Dr. Mohamed Farouk Abdelkader**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Rizk**

Date: 10/2020

ECE 515
Electromagnetic Wave Propagation
Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Electromagnetic wave Propagation	**Code Symbol: ECE515**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in electromagnetics theory and engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in electromagnetics and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of electromagnetics waves propagation applications in engineering. The course is meant to create the deep understanding of the physics behind the phenomena of radiation and reception of electromagnetic waves. The course is meant also to enhance the ability of the student to integrate the proper electromagnetic wave form in various communication systems. Emphasis will be on the recent models and advanced methods of analysis and synthesis.

2- Course Objectives:

The main Objectives of this course are to equip the students with:

1. Collect knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to electromagnetic waves engineering.
2. Gain skills in the definition, physics, analysis, and solving of problems related to electromagnetic waves propagation.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using electromagnetic wave propagation.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to electromagnetic wave propagation.
5. Identify current problems and find solutions for it using electromagnetic waves equations and models in the area of communication systems.
6. Review the basics and the methodologies of scientific research and the use of its different tools in the area of electromagnetic wave propagation.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of wireless communications.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize the radiation phenomenon of the electromagnetic waves. a1-2-2 Recognize the wave reception by the and transmission through boundaries. a1-2-3 Classify the wave models according to their physical structure and properties. a1-2-4 Discuss the main methods of analysis of electromagnetic waves.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electromagnetic waves field.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional researchpracticein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the electromagnetic wave propagation problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electromagnetic wave propagation.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electromagnetic wave propagation problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on electromagnetic wave propagation.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electromagnetic wave propagation.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about electromagnetic wave propagation.

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**
1. Electromagnetic theory principles.	6	6	-	--
2. Electromagnetic wave equations.	6	6	-	--
3. Electromagnetic potential and Hertz vectors.	9	9	-	--
4. Time varying medium.	9	9	-	--
5. Electromagnetic wave propagation in dielectric materials.	9	9	-	--
6. Reflection and transmission at boundaries.	9	9	-	--
7. Surface waves.	9	9	-	--
8. Wave propagation in multilayer materials.	9	9	-	--
9. Ionosphere wave propagation.	9	9	-	--
10. Line of sight propagation model.	9	9	-	--
Total	84	84	-	--

5- <u>Relationship between the course and the program</u>

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2, A3-1	B1-1, B3-1	C1-1, C2-1	D5-1, D8-1

6- <u>Course Subject Area:</u>

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Discretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- <u>Course Topics.</u>

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to the electromagnetic waves.	1-2
2nd	Electromagnetic theory principles.	3-4
3rd	Electromagnetic wave equations.	5-7
4th	Electromagnetic potential and Hertz vectors.	8-10
5th	Time varying medium.	11-13
6th	Electromagnetic wave propagation in dielectric medium.	14-16

7th	Reflection and transmission at boundaries.	17-19
8th	Surface waves.	20-22
9th	Wave propagation in multilayer materials.	23-25
10th	Line of sight propagation models.	26-28

8- ILOs Matrix Topics

Course ILOs	Course topics									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
a1-2-1 Recognize the radiation phenomenon of the electromagnetic waves.	x	x					x		x	x
a1-2-2 Recognize the wave reception by the and transmission through boundaries.	x	x			x		x		x	x
a1-2-3 Classify the wave models according to their physical structure and properties.	x		x	x		x	x	x	x	x
a1-2-4 Discuss the main methods of analysis of electromagnetic waves.	x	x	x	x	x	x	x	x	x	x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electromagnetic waves field.			x	x		x			x	x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the electromagnetic wave propagation problems.	x	x	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electromagnetic wave propagation.			x	x	x	x		x		
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electromagnetic wave propagation problems, using latest engineering techniques, skills, and tools.			x	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on electromagnetic wave propagation.										x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about			x			x	x	x	x	

electromagnetic wave propagation.										
d8-1-1 Exhibit the ability to learn more about electromagnetic wave propagation.	x		x	x	x		x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. C. A. Balanis, ”Antenna Theory – Analysis and Design,” John Wiley & Sons, 2005.

2. S. Cloude, ” An Introduction to Electromagnetic wave propagation and Antennas,” Springer, 1996.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Heba Y. Soliman**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Rizk**

Updated Date: 10/2020.

ECE 516
Introduction to Statistical Communication and Information Theory

Course Specifications

Course Specification

Program on which the course is given	**M. Sc. in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc. Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Introduction to statistical communication and information theory	**Code Symbol: ECE516**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in signals and systems. The course is designed to widen background in system analysis by preparing the graduates for advanced study in different areas of random signals analysis. The course is meant to create the deep understanding of the basics and theories behind the modern random system analysis and their applications in communication systems, and information theory

.

2- Course Aims:

The main objectives of this course are to:

1. Gain knowledge and understanding of key and advanced principles, theories, concepts, and techniques relevant to random sigmals analysis.
2. Reviewtechniques of random signal analysis in communication systems.
3. Classify modern methods to identify/solve complex problems related to random systems.
4. Identify solutions for communicationproblems it using random system analysis.
5. Apply specialized knowledge and combine it with relevant knowledge in his/her practice in the area of information theory.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge, concepts and theories of mathematics to understandprobabilities and stochastic processes. a1-1-2 Demonstrate sufficient essential knowledge, concepts and theories of mathematics todevelop mathematical models for random signals. a1-1-3 Demonstrate sufficient essential knowledge, concepts and theories of mathematics

	related to information theory.
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Illustrate the response of linear systems to random inputs. a1-2-2 Describe information sources, channels, noises, and information rates. a1-2-3 Demonstrate additional knowledgeon channel capacity. a1-2-4 Recognize entropy. a1-2-5 Describe the codingmethods. a1-2-6 Describe Markov chains.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to information theory.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Analyze, interpret and manipulate data with a non-classical nature and relate it to solve professional problems related to statistical methods in communications and to information theory.
Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems related to statistical methods in communications and to information theory.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis of statistical communication systems and to information theory problems.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to statistical methods in communications and to information theory.

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**
1. Probabilities and stochastic processes	15	15	-	--
2. Mathematical models for random signals.	15	15	-	--
3. Response of linear systems to random inputs.	18	18	-	--
4. Information transmission, Entropy and Coding.	18	18	-	--
5. Markov chains and applications	18	18	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contribute in achieving	**A1-1, A1-2**	**B1-1, B2-1**	**C1-1, C1-2**	**D2-1**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Probabilities and stochastic processes	1-5
2nd	Mathematical models for random signals.	6-10
3rd	Response of linear systems to random inputs.	11-16
4th	Information transmission, Entropy and Coding.	17-22
5th	Markov chains and applications.	23-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th
Course ILOs	Knowledge & Understanding				
a1-1-1 Demonstrate sufficient essential knowledge, concepts and theories of mathematics to understandprobabilities and stochastic processes.	x				

a1-1-2 Demonstrate sufficient essential knowledge, concepts and theories of mathematics todevelop mathematical models for random signals.		x			
a1-1-3 Demonstrate sufficient essential knowledge, concepts and theories of mathematics related to information theory.		x			
a1-2-1 Illustrate the response of linear systems to random inputs.			x		
a1-2-2 Describe information sources, channels, noises, and information rates.				x	
a1-2-3 Demonstrate additional knowledgeon channel capacity.				x	
a1-2-4 Recognize entropy.				x	
a1-2-5 Describe the codingmethods.				x	
a1-2-6 Describe Markov chains.					x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to information theory.	x	x	x	x	x
b2-1-1 Analyze, interpret and manipulate data with a non-classical nature and relate it to solve professional problems related to statistical methods in communications and to information theory.	x	x	x	x	x
c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems related to statistical methods in communications and to information theory.	x	x	x	x	x
c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis of statistical communication systems and to information theory problems.	x	x	x	x	x
d2-1-1 Use state-of-the-art computer aided design tools for solving professional problems related to statistical methods in communications and to information theory.	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x				x								
	a1-1-2	x				x								
	a1-1-3	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
Intellectual Skills	b1-1-1					x								
	b2-1-1					x							x	
Professional and practical skills	c1-1-1					x								
	c1-2-1			x		x							x	
General Skills	d2-1-1			x					x				x	

10- Assessment
10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	Decided by the College Council
Total	**100%**	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using random systems simulators on general computer labs during the class or/and home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. S.L.Miller and D. Childers, "Probability and random processes with applications to signal processing and communications," Academic Press, 2nd Edition, 2012.

2. S. Haykin and M. Moher, "Communication Systems" 5th Edition, John Wiley and sons, 2009.

3. B. P. Lathi and Zhi Ding, "Modern Digital and Analog Communication Systems," The Oxford Series in Electrical and Computer Engineering, Oxford University Press, 4th Edition, 2010.

13- Program Coordination Committee:

Course Coordinator: **Dr. Sherif M. Abuelenin**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 517
Optics and Laser
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Optics and Laser	**Code Symbol: ECE517**	
Lecture	**3 hours**	
Tutorial / Laboratory	**0 hours**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the students with a solid background on the problems encountered in optics and lasersuch as attenuation and dispersion. Also, the transmitter, receiver systems, splices, connectors, and laser action will be considered.This course is help students meet the demand of growing semiconductor optoelectronic industry and prepares them to advanced study and research in the semiconductor optics and laser devices and to be familiar with recent trends in optics and laser. The covered topics relate to: basic semiconductor optical properties, optical materials, analysis and design of LED for Optical communication, principles of laser action and theory of semiconductor laser.

2- Course Objectives:

1. Review basic concepts of optical fibers, transmitter, and receiver modules.
2. Gain necessary background in waveguides and transmission of light in optical fiber.
3. Classify optical amplification techniques.
4. Explain methods of optical fiber components and multiplexing and demultiplexing.

3- Intended Learning Outcomes (ILOs):

Field	Program ILOs that the course contribute in achieving	Course ILOs

Knowledge & Understanding	A1-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	**a-1-2-1 Review the basic physics of light necessary for understanding optics and laser.** **a1-2-2 Describe the propagation of plane waves inside the optical fiber.** **a1-2-3 Studying the principles of design of Optical amplification – multiplexing and demultiplexing.** **a1-2-4Explain Splices and connectors – light sources and transmitters – receivers.** **a1-2-5Describe Principles of LD Action. Analysis and Design of LED for Optical Communication** **a1-2-6Demonstrate sufficient essential knowledge and a deep understanding to the principles of Laser Action.** **a1-2-7Explain the theory of Semiconductor Laser with emphasis on their physical structure, properties, and applications.** **a1-2-8 Demonstrate a basic understanding of the Quantum Well Lasers.**
Intellectual skills	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional researchpractice in Electronics and Communication Engineering.	**b1-1-1Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to optics and laser.**
	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	**b2-1-1Solve specialized problems with available givens and parameters in optical components, optical amplifiers, multiplexing, and demultiplexing.**
Professional skills	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	**c1-1-1Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve problems pertaining to optics and laser.**
	C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	**c2-1-1Professionally write reports about the evaluation of the performance of the current optics and laser.**
	C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her	**c3-1-1Evaluate methods and tools reported in a specified published articles and researches concerning optical amplifiers, multiplexing, and demultiplexing.**

	research topic in electronics and communications field.	
General skills	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	**d5-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in optics and laser.**

4-Course Contents

Week No.	Topic	Total Hours	Contact hrs		
			Lec.	**Tut.**	**Lab.**
Weeks 1-4	**Lecture:** Introduction to telecommunications and fiber optics - Physics of light (waveguide and quantum theories).	12	12	-	
Weeks 5-8	**Lecture:** Attenuation and dispersion.	12	12		
Weeks 9-16	**Lecture:** Optical amplification – multiplexing and demultiplexing. Splices and connectors – light sources and transmitters – receivers.	24	24		
Weeks 17-20	**Lecture:** Principles of LD Action. Analysis and Design of LED for Optical Communication.	12	12		
Weeks 21-24	**Lecture:** Principles of Laser Action.	12	12		
Weeks 25-26	**Lecture:** Theory of Semiconductor Laser.	6	6		
Weeks 27-28	**Lecture:** Quantum Well Lasers.	6	6		

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contributes in achieving.	**A1-2**	**B1-1, B2-1**	**C1-1, C2-1, C3-1**	**D5-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to telecommunications and fiber optics - Physics of light (waveguide and quantum theories).	1-4
2nd	Attenuation and dispersion	5-8
3th	Optical amplification – multiplexing and demultiplexing. Splices and connectors – light sources and transmitters – receivers.	9-16
4th	Principles of LD Action. Analysis and Design of LED for Optical Communication.	17-20
5th	Principles of Laser Action.	21-24
6th	Theory of Semiconductor Laser.	25-26
7th	Quantum Well Lasers.	27-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics						
		1st	2nd	3rd	4th	5th	6th	7th
Knowledge & Understanding	**a-1-2-1 Review the basic physics of light necessary for understanding optics and laser.**	X						
	a1-2-2Describe the propagation of plane waves inside the optical fiber.		X					
	a1-2-3Studying the principles of design of Optical amplification – multiplexing and demultiplexing.			X				
	a1-2-4 Explain Splices and connectors – light sources and transmitters – receivers.			X				
	a1-2-5 Describe Principles of LD Action. Analysis and Design of LED for Optical Communication				X			
	a1-2-6Demonstrate sufficient essential knowledge and a deep understanding to the principles of Laser Action.					X		
	a1-2-7Explain the theory of Semiconductor Laser with emphasis on their physical structure, properties, and applications.						X	
	a1-2-8 Demonstrate a basic understanding of the Quantum Well							X

	Lasers.							
Intellectual Skills	**b1-1-1Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to optics and laser.**		X	X	X	X	X	X
	b2-1-1Solve specialized problems with available givens and parameters in optical components, optical amplifiers, multiplexing, and demultiplexing.			X			X	
Professional Skill	**c1-1-1Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve problems pertaining to optics and laser.**	X	X	X	X	X	X	X
	c2-1-1Professionally write reports about the evaluation of the performance of the current optics and laser..					X	X	X
	c3-1-1Evaluate methods and tools reported in a specified published articles and researches concerning optical amplifiers, multiplexing, and demultiplexing.			X			X	
General Skills	**D5-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in optics and laser.**			X	X	X	X	X

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a12-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x								
	a1-2-8	x				x								
Intellectual Skills	b1-1-1					x							x	
	b2-1-1					x							x	
Professional Skills	c1-1-1					x			x	x				
	c2-1-1		x						x	x				

	c3-1-1							x					x	
General Skills	d5-1-1								x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

<u>11- Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. D. K. Mynbaev and L. L. Scheiner, Fiber-Optic Communications Technology, Prentice Hall, 2001.
2. J. M. Senior, Optical Fiber Communications: Principles and Practice, Prentice-Hall, Third Edition, 2009.
3. K. Okamoto, Fundamentals of Optical Waveguides, Second Edition, Academic Press, 2010.

13- <u>Program Coordination Committee:</u>

.Course Coordinator	Program Coordinator
Dr. Rania Mohamed Abdallah	Dr. Saly Saad Hassaneen

Head of the DepartmentProf. Dr. Rawya Yehia Rizq

10/2020

ECE 518

Digital Communication theory

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Digital Communication Theory	**Code Symbol: ECE518**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in digital communication theoryengineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in digital communications technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of digital communications theory. The course is meant to create the deep understanding of the optimum receivers behind the fundamental limits in coding and modulation. The course is meant also to enhance the ability of the student to integrate the different types of coding channel in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives

The main Objectives of this course are to equip the students with:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to digital communication theory.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to digital communication theory.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using digital communication theory.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to communication theory.
5. Identify current problems and find solutions for it using digital communication theory design.
6. Apply the basics and the methodologies of scientific research and the use of its different tools in the area of digital communication theory.
7. Collect specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of digital communication theory.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the optimum receiver in digital communication theory. a1-2-2 Recognize the methods of analysis for channel coding in digital communication theory. a1-2-3 Recognize the filtered channel and interference a1-2-4 Describe fading channel in digital communication theory.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and recognize the professional aspects of digital communication theory applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of different types channel coding in advanced electronics and communication theory. a3-1-2 Report new advances in analysis and design methodologies in digital communicationtheory, and their historical development.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital communication systems problems
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Capacity and cutoff rates in digital communication theory.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of different types of channel coding

C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital

professional skills to solve engineering problems.	communication systems problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on optimum receivers.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional digital theory problems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital communication theory.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about digital communication theory.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Revision on the undergraduate materials related to digital communication systems	6	6	-	--
2. Optimum receivers in gaussian noise, maximum likelihood detection	6	6	-	--
3. Fundmental limits in coging and modulation	12	12	-	--
4. Block- convolutional and trellis coding .	12	12	-	--
5. Viterbi detection, coding for channel with interfernce .	12	12	-	--
6. Combined equalization and coding.	24	24	-	--
filtered channel and inter symole interference, fading channels 7.	12	12	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributesin achieving	A1-1, A2-1, A3-1,	B1-1, B3-1, ,B5-1	C1-1, C2-1	D2-1, D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to digital communication theory	**1-2**
2nd	Optimum receivers in Gaussian noise, maximum likelihood detection	**3-4**
3rd	Fundamental limits in coding and modulation	**5-8**
4th	Block- convolutional and trellis coding .	**9-12**
5th	Viterbi detection, coding for channel with interference .	**13-16**
6th	Combined equalization and coding.	**17-24**
7th	Filtered channel and intersymole interference, fading channels	**25-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Describe the optimum receiver in digital communication theory.	x	x					
a1-2-2 Recognize the methods of analysis for channel coding in digital communication theory.			x	x			
a1-2-3 Recognize the filtered channel and interference					x	x	
a1-2-4Describe fading channel in digital communication theory.							x
a2-1-1 Report and recognize the professional aspects of digital communication theory applications and their effects on the Environment.	x	x					
a3-1-1 Classify the Potential applications of different types channel coding in advanced electronics and communication theory.			x	x	x	x	x

a3-1-2Report new advances in analysis and design methodologies in digital communicationtheory, and their historical development		x				x	x
Course ILOs	**Intellectual skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital communication theory problems	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Capacity and cutoff rates in digital communication theory				x	x	x	
b5-1-1 Evaluate pros and cons of different types of channel coding							
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital communication theory problems, using latest engineering techniques, skills, and tools.		x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on optimum receivers.			x	x	x	x	x
Course ILOs	**General and transferrable skills**						
d2-1-1 Use state-of-the-art computer aided design tools for solving professional digital theory problems.			x	x	x	x	
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital communication theory and technology.			x	x		x	x
d8-1-1 Exhibit the ability to learn more about digital communication theory.			x	x		x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer	Practical
Knowledge	a1-2-1	x		x										

&understanding	a1-2-2	x		x										
	a1-2-3	x		x		x								
	a1-2-4	x		x										
	a2-1-1	x		x					x	x				
	a3-1-1	x		x					x	x				
	a3-1-2		x			x				x				
Intellectual Skills	b1-1-1		x			x								
	b3-1-1		x	x		x								
	B5-1-1		x			x								
Professional Skills	c1-1-1		x			x								
	c2-1-1		x	x		x			x	x				
General Skills	d2-1-1			x									x	
	d5-1-1		x	x					x	x				
	d8-1-1								x	x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of references:</u>

1. Simon Haykin, Michael Moher, "Communication Systems", 5th Edition, John Wiley & Sons (Mar. 16th, 2009).

2. M.K. Simon and M. S. Alouini,''Digital Communication over fading channel.''John Wiley and Sons, 2000.

13- <u>Program Coordination Committee:</u>

Course Coordinator: **Dr. Heba AbdElatty**

Program coordinator: **Dr. Saly Saad Hassaneen**

Head of the Department: **Prof. Dr. Rawya Rizk**

Updated Date: / 10/2020

ECE-519

Mobile Communications

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Mobile Communications	**Code Symbol: ECE519**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in mobile communication. For those students who look toward an industrial position after graduation, this course is designed to widen background in mobile communication technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of mobile communication. The course is meant to create the deep understanding of the basics and theories behind the modern mobile communication systems. The course is meant also to enhance the ability of the student to integrate the proper digital devices in various mobile communication systems. Emphasis will be on the new devices and advanced methods of analysis and design

2- Course Objective

The main Objectives of this course are to:

1. Explain key and advanced facts, theories, concepts, principles and techniques relevant to mobile communications.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to mobile communications.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using mobile communications.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to mobile communications.
5. Identify current problems and find solutions for it using mobile communication systems design.
6. Review the basics and the methodologies of scientific research and the use of its different tools in the area of mobile communications.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of mobile communications.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Describe the main differences between radio environment in mobile communication.
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe cellularmobile systems. a1-2-2 Demonstrate frequency reuse and propagation in urban and suburban environment in mobile a1-2-3 Discuss mobile radio channels a1-2-4 Demonstrate mobile communication protocols and messaging and capacity
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Discuss the social effects of the increasing usage of the mobile communications on the environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to mobile communication.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toto a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the mobile communication problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to mobile communications.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to mobile communications problems, using latest engineering techniques, skills, and tools.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to mobile communications.

4- <u>Course Contents</u>

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Introduction to Cellular Mobile Systems and Frequency Reuse.	12	12	-	--
2. Mobile Radio Environment – Signal Propagation in Urban and Suburban Environment.	12	12	-	--
3. Probability of signal outage, threshold crossing rate and average fade, non fade duration.	12	12	-	--
4. Models for Path Loss – Rayleigh Fading and Longnormal Shadowing – Co-channel Interference Reduction.	12	12	-	--
5. Mobile Communication Protocols Messaging	9	9	-	--
6. Capacity , Spread Spectrum,and CDMA	12	12	-	--
7. Paging Design and planning of cellular voice networks, Performance of digital cellular networks.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	**A1-1, A1-2, A2-1, A3-1**	**B1-1, B3-1**	**C1-1**	**D2-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disscretionry subjects	Total
---	---	30%	70%	-			100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction to Cellular Mobile Systems and Frequency Reuse.	1-4
2nd	Mobile Radio Environment – Signal Propagation in Urban and Suburban Environment.	5-8
3rd	Probability of signal outage, threshold crossing rate and average fade, non fade duration.	9-12

4th	Models for Path Loss – Rayleigh Fading and Longnormal Shadowing – Co-channel Interference Reduction.	13-16
5th	Mobile Communication Protocols Messaging	17-19
6th	Capacity , Spread Spectrum,and CDMA	20-23
7th	Paging Design and planning of cellular voice networks, Performance of digital cellular networks.	24-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						
a1-1-1 Describe the main differences between radio environment inmobile communications.	x	x					
a1-2-1 Describe cellularmobile systems..	x	x					
a1-2-2 Demonstrate frequency reuse and propagation in urban and suburban environment in mobile		x	x	x			
a1-2-3 Discuss mobile radio channels			x	x			
a1-2-4 Demonstrate mobile communication protocols and messaging and capacity.					x		
a2-1-1 discuss the social effects of the increasing usage of the mobile communicationson the environment.	x		x	x		x	x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to mobile communications.						x	x
Course ILOs	**Intellectual skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the mobile communications problems.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to mobile communications.			x	x		x	x
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to mobile communications problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
Course ILOs	**General and transferrable skills**						

d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to mobile communications.	x		x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a2-1-1	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1					x								
	b3-1-1		x			x								
Professional Skills	c1-1-1	x				x			x	x				
General Skills	d2-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination	:	To assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	Decided by the College Council
Total	**100%**	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

[1] Martin Sauter,. *From GSM to LTE-advanced Pro and 5G: An introduction to mobile networks and mobile broadband.* John Wiley & Sons, 3rd edition 2017.

[2] H. Holma, and A. Toskala,. *LTE for UMTS.: Evolution to LTE-Advanced.* John Wiley & Sons, 5th edition, 2010.

[3] Andrea Goldsmith,.*Wireless communications*. Cambridge university press, 2005.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Heba AbdElatty**
Programcoordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Rizk**

Updated Date: 10/2020

ECE 520

Satellite Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc. in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc. Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Satellite Communication Systems	**Code Symbol: ECE 520**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course aims at providing students with the basic knowledge and understanding of satellite communication systems, and with the principles of satellite spacecraft subsystems, satellite orbits, satellite link models, multiplexing and multiple access techniques, .

2- Course Objectives:

The main objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to satellite communication systems.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to satellite communication systems.
3. Review probability and statistics to identify/solve complex problems related to satellite communication systems.
4. Identify current problems and find solutions for it in the area of satellite communications.
5. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of satellite communication systems.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the	a1-2-1 Recognize components of satellite communication systems

concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-2 Classify satellite orbits a1-2-3 Discuss and explain link models.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologies and its impacts on the environment.	a2-1-1 Report and recognize the various aspects of satellite communication systems and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the applications of satellite communication systems. a3-2-1 Report new advances in analysis and design methodologies in satellite systems, and their historical development.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering .	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to satellite communications.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve satellite link budget analysis problems.
B5-1 Assess and analyze risks of the professional practice in electronics and communications engineering.	b5-1-1 Evaluate pros and cons of different satellite orbital patterns. b5-1-2 Evaluate pros and cons of different multi access techniques.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to satellite communication systems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on satellite orbital patterns.
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	c3-1-1 Evaluate the use of multiple access techniques in satellite communications.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade

upgrade and enhance their conceptual knowledge.	and enhance their conceptual knowledge about satellite communications.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Satellite systems configurations and frequency allocation	6	6	--
2- Link Calculations, propagation effects and power budget and noise.	12	12	--
3- Orbiting Satellites	6	6	--
4- Digital modulation, coding, and Multiplexing	12	12	--
5- Terrestrial interface systems	12	12	--
6- Multiple Access	24	24	--
7- Earth station (transmitter and receiver design)	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2-1, A3-1	B1-1, B3-1 B5-1	C1-1, C2-1 C3-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Satellite systems configurations and frequency allocation	**1-2**
2nd	2- Link Calculations, propagation effects and power budget and noise.	**3-6**
3rd	3- Orbiting Satellites	**7-8**

4th	4- Digital modulation, coding, and Multiplexing	**9-12**
5th	5- Terrestrial interface systems	**13-16**
6th	6- Multiple Access	**17-24**
7th	7- Earth station (transmitter and receiver design)	**25-28**

8- ILOs Matrix Topics

Course topics	**Course topics**						
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
a1-2-1 Recognize components of satellite communication systems	x						
a1-2-2 Classify satellite orbits			x				
a1-2-3 Discuss and explain link models.		x					
a2-1-1 Report and recognize the various aspects of satellite communication systems and their effects on the Environment.	x						
a3-1-1 Classify the applications of satellite communication systems.			x				
a3-2-1 Report new advances in analysis and design methodologies in satellite systems, and their historical development.	x		x			x	
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to satellite communications.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve satellite link budget analysis problems.		x	x	x	x	x	x
b5-1-1 Evaluate pros and cons of different satellite orbital patterns. b5-1-2 Evaluate pros and cons of different multi access techniques.		x	x			x	
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to satellite communication systems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on satellite orbital patterns.	x	x	x	x	x	x	x
c3-1-1 Evaluate the use of multiple access techniques in satellite communications.						x	

d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about satellite communications.				x	x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x		x		x								
	a1-2-2	x		x		x								
	a1-2-3	x		x		x								
	a2-1-1	x		x		x								
	a3-1-1	x		x		x								
	a3-2-1	x		x		x								
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x					
	b5-1-2								x					
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x					
	c3-1-1									x				
General Skills	d5-1-1								x					

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

1. **Wayne Tomassi, "Advanced Electronic Communications Systems," Pearson, 6th Edition, 2014.**
2. **Timothy Pratt, and Charles Bostian "Satellite Communications," John Wiley & sons, 2003.**
3. **Dennis Roddy, "Satellite Communications," McGraw-Hill Educatio, 4th edition, 2006.**

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif Abuelenin**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: / 10/2020

ECE 521
Coding Theory
Course
Specification

Course Specification

Program on which the course is given	MS.C in Electrical Engineering (Specialization: Electronics and Communications Engineering).
Major or minor element of program	Major
Department offering the program	Electrical Engineering
Department offering the course	Electrical Engineering
Academic year/Level	MS.C
Date of specification approval	***2020***

A- Basic Information

Title: Coding Theory	**Code Symbol**: **ECE 521**	
Lecture	3 hours	
Tutorial / Laboratory	**-**	
Total	3 hours	Bylaw 2000

B- Professional Information

1- Course Aims:

This course will introduce the student to the fundamentals of error-correcting codes and their applications in communication systems. Its goal is to develop the ability to design and analyze classical methods of error-control coding. Error control coding is an indispensable part of any digital communication system. This introductory course discusses theory of linear block codes and convolutional codes, their encoding and decoding techniques as well as their applications in real world scenarios. Starting from simple repetition codes, other codes will be discussed such as: Hamming codes, Reed Muller codes, low density parity check codes, and turbo codes. Performance evaluation of using codes in various communication channels is briefly discussed at the end for the course.

2- Course objectives:

- Review fundamentals of error-correcting codes and their applications in communication systems.
- Develop the ability to design and analyze classical methods of error-control coding. Error control coding is an indispensable part of any digital communication system.
- Discuss Hamming codes, Reed Muller codes, low density parity check codes, and turbo codes.
- Apply codes in various communication channels.

3- Intended Learning Outcomes (ILOs) forthewholeprogram

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

NAQAAE Academic Reference Standards (ARS)	Program ILOs	Course ILOs
A. Knowledge and understanding		
A1- Basic facts &theories in the field of	A1-1 Demonstrate sufficient essential knowledge and	a1-1-1 Explain the channel code-rate theory and its use in coding theory .

electronics and communications, and interrelated fields.	understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-2 Discuss the fundamental theory of coding
A3- Main scientific advances in the field of electronics and communications.	A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the different coding techniques used in digital communication systems.
A5- Basics and principles of quality in professional practice in the field of specialization.	A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Report and discuss effects of coding on digital communication performance
B. Intellectual skills		
B1- Analyze and evaluate of information in the field of specialization and make full use of such information to solve problems.	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to evaluate coding techniques.
B2- Solve specific problems on the basis of limited and contradictory information. .	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Apply broad knowledge of coding theory and its computation methods and use it in digital communication systems.
C. Professional and practical skills		
C1- Apply the basic as well as the modern professional skills in the field of specialization.	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to evaluate coding techniques.
D. General and transferrable skills		
D2- Demonstrate	D2-1 Demonstrate efficient	d2-1-1 Use state-of-the-art computer

efficient IT capabilities in such a way that serves in the development of the professional practice.	IT capabilities in such a way that serves in the development of him/ her professional practice and research.	aided simulation tools for solving professional problems related to coding theory
D5- Use different sources of information to obtain data.	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital control systems

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical/Tutorial Hours
1- Introduction to Coding theory	**12**	**12**	--
2- Linear block Codes	18	18	--
3- Convolution coding and decoding	**18**	**18**	--
4- Turbo Coding and decoding	**18**	**18**	--
5- Performance evaluation of channel coding techniques	18	18	--
Total	**84**	**84**	**--**

5- Relationshipbetweenthecourseandtheprogram

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	(A1-1), (A3-1), (A5-1)	(B1-1), (B2-1)	(C1-1)	(D2-1), (D5-1)

6- Course Subject Area:

A	B	C	D	E	F	
HumanitiesandSocial Science	Mathematicsand Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applicationsand ICT	Projects andpractice	Disccret
---	30%	40%	30%	-	-	

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Introduction to Coding theory	1-4
2nd	2- Linear block Codes	5-10
3rd	3- Convolution coding and decoding	11-16
4th	4- Turbo Coding and decoding	17-22

5th	5- Performance evaluation of channel coding techniques	23-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th
Course ILOs	**Knowledge & Understanding**				
a1-1-1 Explain the channel code-rate theory and its use in coding theory .	x				x
a1-1-2 Discuss the fundamental theory of coding	x				
a3-1-1 Classify the different coding techniques used in digital communication systems.		x	x	x	x
a5-1-1 Report and discuss effects of coding on digital communication performance		x	x	x	x
Course ILOs	**Intellectual Skills**				
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to evaluate coding techniques.	x	x	x	x	x
b2-1-1 Apply broad knowledge of coding theory and its computation methods and use it in digital communication systems.		x	x	x	x
Course ILOs	**Professional Skill**				
c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to evaluate coding techniques.	x	x	x	x	x
Course ILOs	General Skills				
d2-1-1 Use state-of-the-art computer aided simulation tools for solving professional problems related to coding theory		x	x	x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital control systems	x	x	x	x	x

8- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture+ **online sessions**	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x			x	x								
	a1-1-2	x			x	x								
	a3-1-1	x			x	x								
	a5-1-1	x			x	x								
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
Professional Skills	c1-1-1				x	x								
General Skills	d2-1-1												x	
	d5-1-1		x							x				

9- <u>Assessment</u>

9.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- <u>Facilitiesrequiredforteachingandlearning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratoryUsage:

Students are expected to prepare and conduct some simulation assignments using MATLAB simulators using general computer labs.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Introduction to Coding Theory by J. H. van Lint. Springer-Verlag, Berlin, 1999.
- Introduction to Coding Theory by Ron M. Roth, Cambridge University Press, 2006.
- Algebraic codes for data transmission by Richard E. Blahut, Cambridge University Press, 2003.

12- <u>ProgramCoordinationCommittee:</u>

Course Coordinator:	**Dr. Mohamed Farouk Abdelkader**
Program coordinator:	**Dr. Saly Saad Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Rizk**

Date: 10/2020

ECE 522
Optical Fibers
Course
Specification

Course Specification

Program on which the course is given:	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program:	**Major**
Department offering the program:	**Electrical Engineering**
Department offering the course:	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval:	**2020**

A- Basic Information

Title: Optical Fibers	Code Symbol: ECE 522	
Lecture	3 hours	
Tutorial / Laboratory	-	
Total	3 hours	Bylaw 2004

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in optical fibers. Also, this course provides the background relating to the manufacturing and characterization techniques ofoptical fibers. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of optical engineering, electronics and communication.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to optical fibers.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to optical fibers.
3. Develop models and use techniques, principles of optical fibers design.
4. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of optical sources and receivers.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize the concepts of the most common asymmetric slide optical fibers. a1-2-2 Classify the optical fibers according to their coefficients. a1-2-3 Describe the wave motion in fibers. a1-2-4 Recognize the energy band structure and the lattice vibration.

	a1-2-5 Discuss the WKB method.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of optical fibers in advanced electronics and communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional researchpractice in Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to optical fibers.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to optical fibers.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems..	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical waveguide design.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical fibers types and technology.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Optical communications systems.	6	6	--
2- The use of optical fibers.	6	6	--
3- Asymmetric slide waveguide.	6	6	--
4-Types of optical fibers.	6	6	--
5- Refractive index.	6	6	--
6- WKB method.	6	6	--
7- WKB method.	6	6	--
8- Wave processing.	12	12	--
9- Dispersion.	12	12	--

10- Attenuation.	6	6	--
11 - Detection.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1-2, A3-1**	**B1-1, B3-1**	**C1-1**	**D5-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**	**-**		**100%**

Course Topics.

Topic No.	Topic	Weeks
1st	Optical communications systems.	**1-2**
2nd	The use of optical fibers.	**3-4**
3rd	Types of optical fibers Asymmetric slide waveguide.	**5-8**
4th	Refractive index.	**9-10**
5th	WKB method.	**11-14**
6th	Wave processing.	**15-18**
7th	Dispersion.	**19-22**
8th	Attenuation.	**23-24**
9th	Detection.	**25-28**

7- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Course ILOs	**Knowledge & Understanding**								
a1-2-1 Recognize the concepts of the most common asymmetric slide optical fibers.			x						
a1-2-2 Classify the optical fibers according to their coefficients.		x	x	x					
a1-5-3 Describe the wave motion in fibers.		x	x			x	x	x	x

a1-2-4 Recognize the energy band structure and the lattice vibration.		x	x	x					
a1-2-5 Discuss the WKB method.					x				
a3-1-1 Classify the Potential applications of optical fibers in advanced electronics and communication systems.	x	x							
Course ILOs	**Intellectual Skills**								
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to optical fibers.			x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to optical fibers.			x	x	x	x	x	x	x
Course ILOs	**Professional Skill**								
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical fiber design.			x	x	x	x	x	x	x
Course ILOs	**General Skills**								
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical fibers types and technology.						x	x	x	x

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a3-1-1	x			x	x								

Intellectual Skills	b1-1-1		x			x								
	b3-1-1		x			x								
Professional Skills	c1-1-1		x			x								
General Skills	d5-1-1		x						x	x				

9- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Safa O. Kasap "Optical fibers and Devices", McGraw-Hill, Second Edition, 2005.
- John M. Senior"Optical Fiber Communications Principles and Practice", Pearson Education Limited, Third Edition, 2009.

13- <u>Program Coordination Committee:</u>

.Course Coordinator	Program Coordinator
Dr. Islam Elsayed Shaalan	**Dr. Saly Saad Hassaneen**

Head of the Department

Prof. Dr. Rawya Yehia Rezk

Electrical Engineering Dept. Faculty of Engineering-Port Said.

10/2020

ECE 600
Electronic Materials
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Electronic Materials	**Code Symbol: ECE 600**	
Lecture	**3 Hours**	
Tutorial / Laboratory	**-**	
Total	**3 Hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in solid state engineering and electronic materials. For those students who look toward an industrial position after graduation, this course is designed to widen background in material engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of solid state engineering and material science: metals, semiconductors, and superconductors, optical, magnetic, and amorphous materials. The course is meant to create the background needed to understand the physics of device operations and also prepare students for advanced courses in solid state and quantum electronics. General electronic materials physics and properties will be taught in the context of technological applications. Emphasis will be on Semiconductor hetero-junctions materials, dielectric materials, and magnetic materials.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to electronic materials.
2. Build advanced skills in the definition, identify, analysis, and solving of problems related to electronic materials.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using electronic materials.
4. Classify quantum statistics to identify/solve complex and open ended engineering problems related to electronic materials.
5. Review the basics and the methodologies of scientific research and the use of its different tools in the area of Electronic Materials.
6. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of Electronic Materials.

3- Intended Learning Outcomes (ILOs):

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the electronic materials according to their physical structure and properties. a1-2-2 Recognize the energy band structure and the lattice vibration process. a1-2-3 Discuss the classical and quantum statistics of electron and hole motion in atoms and crystal. a1-2-4 Discuss the basics differences between the most common electronic materials (Dielectric , magnetic and semiconductor materials) according to their physical structure and conductivity. . a1-2-5 Explain the thermionic emission process. a1-2-6 Describe the thermal and optical effects. a1-2-7 Explain the hetro-juctions materials operation principles.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Recognize the professional aspects of electronic materials applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1Demonstrate knowledge of contemporary, current, and advanced topics related to electronic material and its application paradigms.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic materials.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to electronic materials.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for electronic materials development.
C. Professional and practical skills	

C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electronic materials problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on Photonic semiconductor materials.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic materials types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about electronic materials.

4- Course Contents

Lecture Topic	**Total Hours**	**Lecture Hours**	**Practical /Tutorial Hours**
1- The material crystal structure concepts and properties	12	12	--
2- Energy band structure and lattice vibrations	12	12	--
3- Classical and quantum statistics of Electrons and Holes generation and recombination process	12	12	--
4. Dielectric and Magnetic Materials.	24	24	
5- Thermo Ionic Emission.	6	6	--
6- Thermal and Optical Effects.	6	6	--
7- Hetero-Junctions Materials.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2 -1, A3-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1 , D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social	**Mathematics and Basic**	**Basic Engineering**	**Applied Engineering**	**Computer Applications**	**Projects and**	**Disccretionry subjects**	**Total**

Science	**Sciences**	**Science**	**And Design**	**and ICT**	**practice**		
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	The material crystal structure concepts and properties	1-4
2nd	Energy band structure and lattice vibrations	5-8
3rd	Classical and quantum statistics of Electrons and Holes generation and recombination process	9-12
4th	Dielectric and Magnetic Materials	13 - 20
5th	Thermo Ionic Emission.	21-22
6th	Thermal and Optical Effects.	23-24
7th	Hetero-Junctions Materials.	25-28

8- ILOs Matrix Topics

Course ILOs	Course topics						
	1st	2nd	3rd	4th	5th	6th	7th
a1-2-1 Classify the electronic materials according to their physical structure and properties.	x						
a1-2-2 Recognize the energy band structure and the lattice vibration.		x					
a1-2-3 Discuss the classical and quantum statistics of electron and hole motion in atoms and crystal.			x				
a1-2-4 Discuss the basics differences between the most common electronic materials (Dielectric , magnetic and semiconductor materials) according to their physical structure and conductivity. .				x			
a1-2-5 Explain the thermionic emission processand the thermal and optical effects.					x	x	
a1-2-6 Explain the hetro-juctions materials operation principles.							x
a1-2-7 Explain the hetro-juctions materials operation principles.							X
a2-1-1 Recognize the professional aspects of electronic materials applications and their effects on the Environment.				x	x	x	
a3-1-1Demonstrate knowledge of contemporary, current, and advanced topics related to electronic material and its application paradigms.				x	x	x	x

b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic materials.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to hetro-juctions electronic materials.							x
b5-1-1 Evaluate pros and cons of given methodologies for electronic materials development.				x			x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electronic materials problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on Photonic semiconductor materials.						x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic materials types and technology.				x		x	x
d8-1-1 Exhibit the ability to learn more about electronic materials.				x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x								
	a2-1-1	x		x		x			x					
	a3-1-1	x		x					x					
Intellectual Skills	b1-1-1					x								
	b3-1-1					x								
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1					x								
	c2-1-1		x	x					x	x				
	d5-1-1		x						x	x				
	d8-1-1		x						x	x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Safa O. Kasap "Electronic Materials and Devices", McGraw-Hill, Second Edition, 2005.
- Rolfe E. Hummel "Electronic Properties of Materials ", Springer, Third Edition, 2004.

13- <u>Program Coordination Committee:</u>

Course Coordinator:	**Associate Prof. Dr. Sherif M. Sharroush**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. RawyaYehia Rizk**

Updated Date: 10/2020.

ECE 601

Digital Signal Processing Applications

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Digital Signal Processing Applications.	**Code Symbol: ECE601**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2004**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in digital signal applications . For those students who look toward an industrial position after graduation, this course is designed to widen background in digital signal processing technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of digital signal processing applications. The course is meant to create the deep understanding of the basics and theories behind the modern digital signal processing applications. The course is meant also to enhance the ability of the student to integrate the proper digital devices in various digital systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to digital signal processing applications.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to digital signal processing applications.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using digital signal processing applications.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to digital signal processing applications.
5. Identify current problems and find solutions for it using digital signal processing applications.
6. Apply the basics and the methodologies of scientific research and the use of its different tools in the area of digital signal processing applications.
7. Build specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of digital signal processing applications.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer scienceappropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1. Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and appropriate to different digital signal processing applications.
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1Describe the main differences between Digital filters, adaptive filters. a1-2-2 Illustrate echo cancellers and suppressors, digital signal processing of speech. a1-2-3 Recognize digital image processing techniques. a1-2-4 Discuss the digital image processing applications to Radar. a1-2-5 Discuss the digital image processing applications to Geophysics.
B. Intellectual skills	
B1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronics and communications engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital signal processing problems. b1-1-2differentiate between different digital signal processing applications.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital signal processing problems, using latest engineering techniques, skills, and tools.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational toolsincludingpertaining software packages to analysis and design a process, component, or system related to digital signal processing field.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to digital signal processing systems.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Discrete Fourier Transform, FFTZ transform.	12	12	-	--
2. Digital filters, adaptive filters.	12	12	-	--
3. Application of adaptive filter.	12	12	-	--
4. Echo cancellers and suppressors, digital signal processing of speech.	12	12	-	--
5. Digital image processing.	9	9	-	--
6. Digital image processing applications to Radar.	12	12	-	--
7. Digital signal processing in Geophysics.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1, A1-2	B1-1	C1-1, C1-2	D2-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	-	100%				100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Discrete Fourier Transform, FFTZ transform.	1-4
2nd	Digital filters, adaptive filters.	5-8
3rd	Application of adaptive filter.	9-12
4th	Echo cancellers and suppressors, digital signal processing of speech.	13-16
5th	Digital image processing.	17-19
6th	Digital image processing applications to Radar.	20-23
7th	Digital signal processing in Geophysics.	24-28

8- ILOs Matrix Topics

Course topics	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}	7^{th}
Course ILOs	Knowledge & Understanding						
a1-1-1. Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and appropriate to different digital signal processing applications.	x						
a1-2-1Describe the main differences between Digital filters, adaptive filters.		x	x				
a1-2-2 Illustrate echo cancellers and suppressors, digital signal processing of speech.				x			
a1-2-3 Recognize digital image processing techniques.					x		
a1-2-4 Discuss the digital image processing applications to Radar.						x	
a1-2-5 Discuss the digital image processing applications to Geophysics.							x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital signal processing problems.	x	x	x	x	x	x	x
b1-1-2differentiate between different digital signal processing applications.					x	x	x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital signal processing problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c1-2-1 Use a wide range of computational toolsincludingpertaining software packages to analysis and design a process, component, or system related to digital signal processing field.					x	x	x
d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to digital signal processing systems.	x	x	x	x	x	x	x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self-learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-1-1	x				x								
	a1-2-1	x				x								

	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
Intellectual Skills	b1-1-1					x								
	b-1-2	x		x										
Professional Skills	c1-1-1			x		x								
	c1-2-1												x	
General Skills	d2-1-1								x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

9.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. Computer laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using digital systems simulators on general computer labs during the lectures.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

- Amy Mar, "Digital Signal Processsing Applications,"Prentice Hall, **1990.**
- **J. G. Proakis and D. G. Manolakis, Digital Signal Processing, 3/e, PHI, 2000**
- **V. Oppenheim and R. W. Schafer, Discrete-Time Signal Processing, 3rd Edition, |Pearson, 2010.**
- IEEE Standards.

13- Program Coordination Committee:

Course Coordinator: **Dr. Heba Y. Soliman**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 602

Satellite Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Satellite Communication Systems	**Code Symbol: ECE 602**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course aims at providing students with the basic knowledge and understanding of satellite communication systems, and with the principles of satellite spacecraft subsystems, satellite orbits, satellite link models, and multiple access arrangements.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to electronic materials.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to electronic materials.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using electronic materials.
4. Classify quantum statistics to identify/solve complex and open ended engineering problems related to electronic materials.
5. Identify current problems and find solutions for it in the area of Electronic Materials.
6. Compare the methodologies of scientific research and the use of its different tools in the area of Electronic Materials.
7. Build specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of Electronic Materials.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize components of satellite communication systems a1-2-2 Classify satellite orbits a1-2-3 Discuss and explain link models.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and recognize the various aspects of satellite communication systems and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the applications of satellite communication systems. a3-2-1 Report new advances in analysis and design methodologies in satellite systems, and their historical development.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toto a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering .	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to satellite communications.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve satellite link budget analysis problems.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of different satellite orbital patterns. b5-1-2 Evaluate pros and cons of different multi access techniques.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to satellite communication systems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional	c2-1-1 Write and evaluate a professional report on

technical report pertaining to electronics and communications technical matters.	satellite orbital patterns.
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	c3-1-1 Evaluate the use of multiple access techniques in satellite communications.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about satellite communications.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Satellite systems configurations	6	6	--
2- Link Calculations	12	12	--
3- Orbiting Satellites	6	6	--
4- Signal Processing and Multiplexing	12	12	--
5- Terrestrial interface systems	12	12	--
6- Multiple Access	24	24	--
7- Earth station	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A2-1, A3-1	B1-1, B3-1 B5-1	C1-1, C2-1 C3-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Satellite systems configurations	**1-2**
2nd	2- Link Calculations	**3-6**
3rd	3- Orbiting Satellites	**7-8**
4th	4- Signal Processing and Multiplexing	**9-12**
5th	5- Terrestrial interface systems	**13-16**
6th	6- Multiple Access	**17-24**
7th	7- Earth station	**25-28**

8- ILOs Matrix Topics

Course topics	**Course topics**						
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
a1-2-1 Recognize components of satellite communication systems	x						
a1-2-2 Classify satellite orbits			x				
a1-2-3 Discuss and explain link models.		x					
a2-1-1 Report and recognize the various aspects of satellite communication systems and their effects on the Environment.	x						
a3-1-1 Classify the applications of satellite communication systems.			x				
a3-2-1 Report new advances in analysis and design methodologies in satellite systems, and their historical development.	x		x			x	
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to satellite communications.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve satellite link budget analysis problems.		x	x	x	x	x	x

b5-1-1 Evaluate pros and cons of different satellite orbital patterns. b5-1-2 Evaluate pros and cons of different multi access techniques.		x	x			x	
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to satellite communication systems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on satellite orbital patterns.	x	x	x	x	x	x	x
c3-1-1 Evaluate the use of multiple access techniques in satellite communications.						x	
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about satellite communications.				x	x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ o online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x		x		x								
	a1-2-2	x		x		x								
	a1-2-3	x		x		x								
	a2-1-1	x		x		x								
	a3-1-1	x		x		x								
	a3-2-1	x		x		x								
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x					
	b5-1-2								x					
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x					
	c3-1-1									x				
General Skills	d5-1-1								x					

10- Assessment

10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

1. **Wayne Tomassi, "Advanced Electronic Communications Systems," Pearson, 6th Edition, 2014.**
2. **Timothy Pratt, and Charles Bostian "Satellite Communications," John Wiley & sons, 2003.**
3. **Dennis Roddy, "Satellite Communications," McGraw-Hill Educatio, 4th edition, 2006.**

Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif Abo-El-Enein**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE603

Digital Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Digital Communication Systems	**Code Symbol: ECE603**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in digital communication systems engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in digital communications technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of digital communications systems engineering. The course is meant to create the deep understanding of the basics and theories behind the modern digital communication systems. The course is meant also to enhance the ability of the student to integrate the proper digital devices in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to digital communication systems engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to digital communication systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using digital communication systems.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to communication systems.
5. Identify current problems and find solutions for it using digital communication systems design.
6. Apply the methodologies of scientific research and the use of its different tools in the area of digital communication systems engineering.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of digital communication systems.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the main differences between analog and digital communication systems. a1-2-2 Recognize the methods of analysis for digital communication systems. a1-2-3 Recognize the differences between analog and digital signals.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and recognize the professional aspects of digital communication systems applications and their effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of new types of digital communication systems in advanced electronics and communication systems.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different digital devices and systems development phases
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital communication systems problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to digital communication systems.

C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital communication systems problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on matched filters.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving professional digital systems problems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital communication systems and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about digital communication systems.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Revision on the undergraduate materials related to digital communication systems	12	12	-	--
2. Sampling and pulse modulation, pulse transmission.	12	12	-	--
3. Digital signals and systems, noise and errors.	12	12	-	--
4. Intersymbol Interference, Regenerative repeaters.	12	12	-	--
5. Matched filtering, synchronization techniques.	9	9	-	--
6. Pulse code modulation, band pass digital transmission	12	12	-	--
7. Coherent binary systems, Non coherent binary systems.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving	A1-1, A2-1, A3-1, A5-1	B1-1, B3-1	C1-1, C2-1	D2-1, D5-1, D8-1

6-

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Discretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to digital communication systems	1-4
2nd	Sampling and pulse modulation, pulse transmission	5-8
3rd	Digital signals and systems, noise and errors.	9-12
4th	Intersymbol Interference, Regenerative repeaters.	13-16
5th	Matched filtering, synchronization techniques.	17-19
6th	Pulse code modulation, band pass digital transmission	20-23
7th	Coherent binary systems, Non coherent binary systems.	24-28

8- ILOs Matrix Topics

Course topics	**1^{st}**	**2^{nd}**	**3^{rd}**	**4^{th}**	**5^{th}**	**6^{th}**	**7^{th}**
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Describe the main differences between analog and digital communication systems.	x		x				
a1-2-2 Recognize the methods of analysis for digital communication systems.	x	x	x				x
a1-2-3 Recognize the differences between analog and digital signals.	x		x	x	x	x	
a2-1-1 Report and recognize the professional aspects of digital communication systems applications and their effects on the Environment.	x	x					
a3-1-1 Classify the Potential applications of new types of digital communication systems in advanced electronics and communication systems.		x	x	x	x	x	x

a5-1-1 Explain Quality Assurance concepts of different digital devices and systems development phases		x				x	X
Course ILOs	**Intellectual skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital communication systems problems.	x	x		x		x	X
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to digital communication systems.		x	x		x	x	X
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital communication systems problems, using latest engineering techniques, skills, and tools.		x				x	x
c2-1-1 Write and evaluate a professional report on matched filters.						x	
Course ILOs	**General and transferrable skills**						
d2-1-1 Use state-of-the-art computer aided design tools for solving professional digital systems problems.			x	x	x	x	
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about digital communication systems and technology.						x	x
d8-1-1 Exhibit the ability to learn more about digital communication systems.						x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer	Practical
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1		x							x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
General Skills	d2-1-1												x	
	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. **S. Haykin and M. Moher, "Communication Systems" 5th Edition, John Wiley and sons, 2009.**

1. M.K. Simon and M. S. Alouini,‘‘Digital Communication over fading channel.‘‘John Wiley and Sons, 2000.

13- <u>Program Coordination Committee:</u>

Course Coordinator:	**Dr. Heba Abd Elatty**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE-604

Mobile Communication Systems

Course

Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Mobile Communication Systems	**Code Symbol: ECE604**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in mobile communication systems engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in mobile communication technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of mobile communication systems engineering. The course is meant to create the deep understanding of the basics and theories behind the modern mobile communication systems. The course is meant also to enhance the ability of the student to integrate the proper digital devices in various mobile communication systems. Emphasis will be on the new devices and advanced methods of analysis and design

2- Course Objective

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to mobile communication systems engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to mobile communication systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using mobile communication systems.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to mobile communication systems.
5. Identify current problems and find solutions for it using mobile communication systems design.
6. Apply the methodologies of scientific research and the use of its different tools in the area of mobile communication systems engineering.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of mobile communication systems.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Describe the main differences between propagation models faced by mobile communication systems.
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the main differences between analog and digital mobile communication systems. a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the calculation ofprobability of signal outage, threshold crossing rate, average fade, non fade duration, and average bit error rate in mobile channels. a1-2-3 Discus multiple access to mobile radio channels and spatial distributions in mobile slotted ALOHA networks. a1-2-4 Demonstrate sufficient specialized knowledge and a deep understanding of the design and planning of cellular voice networks and evaluate ofperformance of digital cellular networks.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 discuss the social effects of the increasing usage of the mobile communication systemson the environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to mobile communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toto a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the mobile communication systems problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to mobile communication systems.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to mobile communication systems problems, using latest

	engineering techniques, skills, and tools.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to mobile communication systems.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Introduction, effect of mobiling on communication systems, mobile communication.	12	12	-	--
2. VHF and UHF propagation in land, assessment of deterministic propagation models.	12	12	-	--
3. Probability of signal outage, threshold crossing rate and average fade, non fade duration.	12	12	-	--
4. Average bit error rate in mobile channels with cochannel interference.	12	12	-	--
5. Multiple access to mobile radio channels,.	9	9	-	--
6. Spatial distributions in mobile slotted ALOHA networks.	12	12	-	--
7. Design and planning of cellular voice networks, Performance of digital cellular networks.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	**A1-1, A1-2, A2-1, A3-1**	**B1-1, B3-1**	**C1-1**	**D2-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Discretionry subjects	Total
---	---	30%	70%	-			100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Introduction, effect of mobiling on communication systems, mobile communication.	1-4
2nd	VHF and UHF propagation in land, Assessment of deterministic propagation models.	5-8
3rd	Probability of signal outage, threshold crossing rate and average fade, non fade duration.	9-12
4th	Average bit error rate in mobile channels with cochannel interference.	13-16
5th	Multiple access to mobile radio channels.	17-19
6th	Spatial distributions in mobile slotted ALOHA networks.	20-23
7th	Design and planning of cellular voice networks, Performance of digital cellular networks.	24-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						
a1-1-1 Describe the main differences between propagation models faced by mobile communication systems.		x				x	x
a1-2-1 Describe the main differences between analog and digital mobile communication systems.	x						
a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the calculation ofprobability of signal outage, threshold crossing rate, average fade, non-fade duration, and average bit error rate in mobile channels..			x	x			
a1-2-3 Discuss multiple access to mobile radio channels and spatial distributions in mobile slotted ALOHA networks.					x	x	
a1-2-4 Demonstrate sufficient specialized knowledge and a deep understanding of the design and planning of cellular voice networks and evaluate ofperformance of digital cellular networks							x
a2-1-1 discuss the social effects of the increasing usage of the mobile communication systemson the environment.	x						x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to mobile communication systems.					x	x	x
Course ILOs	**Intellectual skills**						

b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the mobile communication systems problems.	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to mobile communication systems.					x	x	x
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to mobile communication systems problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
Course ILOs	**General and transferrable skills**						
d2-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to mobile communication systems.	x		x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**													
		Lecture+ online sessions	**Presentation and**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-1-1	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a2-1-1	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1					x								
	b3-1-1		x			x			x					
Professional Skills	c1-1-1	x				x								
General Skills	d2-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written : to assess students' knowledge, understanding, analysis, Examination creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	Decided by the College Council
Total	**100%**	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. William Lee,"Mobile cellular Telecommunications,"McGraw Hill, 2000.
2. G. Stuber, "Principles of Mobile Communications," Springer and Business Media, 2017.
3. IEEE Standards.

13- Program Coordination Committee:

Course Coordinator: **Dr. Heba Abd Elatty**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. RawyaYehia Rizk**

Updated Date: /10/2020

ECE 605

Advanced Electronics Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Advanced Electronic Communication Systems	**Code Symbol: ECE 605**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course aims at providing students with the basic knowledge and understanding of electronic communication signals and systems including; definition of digital signal and systems, base band digital communication systems, modulated digital signals, multiple access techniques, satellite communication systems, mobile communication systems, and data communication systems.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of digital communication systems.
2. Develop models digital modulation systems.
3. Identify multiple access techniques and assess their performances.
4. Review communication systems such as mobile, satellite, and data communication systems.
5. Compare different tools to simulate digital communication systems.
6. Apply specialized knowledge and combine it with relevant knowledge in data communication systems.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize different communication systems and understand the theory behind their operation. a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of base-band digital communication systems to develop his/her

	professional research practice in dealing with this systems.. a1-2-3 Discuss the different modern Digital Modulation Techniques to deal with modulated signals. a1-2-4 Recognize the fundamentals of communications access technologies a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of satellite and mobile communication systems to be able to do research related to these systems. a1-2-6 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of data communications field.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to advanced electronic communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic materials.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze and manipulate data from a variety of sources and relate it to suggest solutions to communication problems.
B4-1Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	b4-1-1 Compare multiple access techniques.
C. Professional and practical skills	
C1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions, using latest engineering techniques, skills, and tools.	c1-1-1Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and	c1-2-1 Use a computational tools including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in advanced electronic communication systems.

communications field.	
C2-1 Write and evaluate a professional report on specialized related to electronics and communications technical matters.	c2-1-1Write and evaluate a professional technical report pertaining to electronics and communications technical matters.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for simulation of digital communication systems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced communication systems/
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about satellite communications, and mobile communications..

4-Course Contents

Lecture Topic	**Total Hours**	**Lecture Hours**	**Practical /Tutorial Hours**
1- Digital Signals and Systems	6	6	--
2- Base-band digital communication systems	12	12	--
3- Modulated digital signals	12	12	--
4- Fundamentals of Communications Access Technologies: FDMA - TDMA - CDMA	18	18	
5- Satellite Comm. Systems.	12	12	--
6- Mobile Comm. Systems	12	12	--
7- Data Communications.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A3-1	B1-1, B3-1 B4-1	C1-1, C1-2, C2-1	D2-1, D5-1 D8-1

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**	**-**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Digital Signals and Systems	**1-2**
2nd	Base-band digital communication systems	**3-6**
3rd	Modern Digital Modulation Techniques	**7-10**
4th	Fundamentals of Communications Access Technologies: FDMA - TDMA - CDMA	**11-16**
5th	Satellite Comm. Systems.	**17-20**
6th	Mobile Comm. Systems	**21-24**
7th	Data Communications.	**25-28**

8- ILOs Matrix Topics

Course ILOs	Course topics						
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
a1-2-1 Recognize different communication systems and understand the theory behind their operation.	x	x			x	x	
a1-2-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofbase-band digital communication systems to develop his/her professional research practice in dealing with this systems.		x					
a1-2-3 Discuss the different modern Digital Modulation Techniques to deal with modulated signals.			x				
a1-2-4 Recognize the fundamentals of communications access technologies				x			
a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of satellite and mobile communication systems to be able to do research related to these systems.					x	x	
a1-2-6 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of data communications field.							x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to advanced electronic communication systems.					x	x	x

b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to electronic materials.	x	x	x	x	x	x	X
b3-1-1 Analyze and manipulate data from a variety of sources and relate it to suggest solutions to communication problems.			x	x	x	x	x
b4-1-1 Compare multiple access techniques.				x			
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to electronic materials problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
c1-2-1 Use a computational tools including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in advanced electronic communication systems.				x	x	x	x
c2-1-1 Write and evaluate a professional report on the advances of a given communication system, such as mobile, satellite, or data comm. systems.					x	x	x
d2-1-1 Use state-of-the-art computer aided design tools for simulation of digital communication systems.					x	x	
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about advanced communication systems/	x	x	x	x	x	x	x
d8-1-1 Exhibit the ability to learn more about satellite communications, and mobile communications..					x	x	

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1			x		x								
	b3-1-1			x		x								

	b4-1-1	x		x					x					
Professional Skills	c1-1-1					x								
	c1-2-1												x	
	c2-1-1		x	x					x					
General Skills	d2-1-1												x	
	d5-1-1		x	x					x	x				
	d8-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, andproblem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments during the lectures and home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

Lecture notes are provided.

Essential Books (Text Books):

Wayne Tomasi, "Advanced Electronic Communications Systems," British Library Cataloguing-in-Publication Data, 2014

13- <u>Program Coordination Committee:</u>

Course Coordinator: **Dr. Saly S. Hassaneen**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: / 10/2020.

ECE 606
Data Communications
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Data Communication	**Code Symbol: ECE 606**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims at providing students with advanced knowledge and understanding of Data Communication Systems; understanding of message and switching, layering, delay models in data networks, multi access, carrier sensing, packet radio, flow control, and examples of systems.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of messaging, switching, and layering in data networks.
2. Collect advanced skills in the definition, analysis, and solving problems.
3. Identify and describe layers of data networks.
4. Identify multi access methods.
5. Explore packet radio.
6. Apply the methodologies of scientific research in the area of data communications.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics appropriate to data communication systems analysis and design.

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize different data communication systems and the theory behind their operation a1-2-2 Basic facts & theories in the field of electronics and communications, and interrelated fields.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of data communications.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to data communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to data communications.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to data communications.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Evaluate pros and cons of different multi access techniques.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Data communication problems, using computer simulation tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on network layers and different protocols.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about data communications.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Message and switching	6	6	--
2- Layering	18	18	--
3- Multi Access Communication	6	6	--
4- Slotted Multi Access	6	6	--
5- Carrier sensing	6	6	--
6- Multi Access reservation	6	6	--
7- Packet Radio Networks	6	6	--
8- Radio in Data networks	6	6	--
9- Flow control	6	6	--
10- Examples	6	6	--
11- Internetworking, ISDN	12	12	--
Total	84	84	--

Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1, A1-2, A2 -1, A3-1	B1-1, B2-1, B3-1	C1-1, C2-1	D5-1

5- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	**30%**	**70%**	-	-		**100%**

6- Course Topics.

Topic No.	Topic	Weeks
1st	1- Message and switching	**1-2**
2nd	2- Layering	**3-8**
3rd	3- Multi Access Communication	**9-10**
4th	4- Slotted Multi Access	**11-12**

5th	5- Carrier sensing	**13-14**
6th	6- Multi Access reservation	**15-16**
7th	7- Packet Radio Networks	**17-18**
8th	8- Radio in Data networks	**19-20**
9th	9- Flow control	**21-22**
10th	10- Examples	**23-24**
11th	11- Internetworking, ISDN	**25-28**

7- ILOs Matrix Topics

Course topics	Course topics										
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**	**11th**
a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics appropriate to data communication systems analysis and design.	x									x	
a1-2-1 Recognize different data communication systems and the theory behind their operation			x	x	x	x	x	x	x	x	x
a1-2-2 Basic facts & theories in the field of electronics and communications, and interrelated fields.										x	
a2-1-1 Report and discuss social effects of data communications.			x	x						x	x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to data communication systems.					x					x	
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to data communications.	x	x	x	x	x	x	x	x	x	x	x
b2-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to data communications.	x	x	x	x	x	x	x	x	x	X	x
b3-1-1 Evaluate pros and cons of different multi access techniques.			x	x	x	x					
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to Data communication problems, using	x	x	x	x	x	x	x	x	x	x	x

computer simulation tools.											
c2-1-1 Write and evaluate a professional report on network layers and different protocols.										x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about data communications.					x					x	x

8- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x		x	x	x								
	a1-2-1	x		x	x	x								
	a1-2-2	x		x	x	x								
	a2-1-1	x		x	x	x								
	a3-1-1	x		x	x	x								
Intellectual Skills	b1-1-1		x											
	b2-1-1		x											
	b3-1-1		x	x					x	x				
Professional Skills	c1-1-1					x					x			
	c2-1-1		x	x					x	x				
	d5-1-1			x					x	x				

9- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

Lectures and Labs notes are provided.

Essential Books (Text Books):

Behrouz A. Forouzan, "Data Communications and networking," Library of Congress Cataloguing-in-Publication Data, 2007.

12- <u>Program Coordination Committee:</u>

Course Coordinator:	**Dr. Islam E. Shaalan**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: / 10/2020

ECE 607
Transmission Systems
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Transmission Systems.	**Code Symbol: ECE607**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in transmission systems. For those students who look toward an industrial position after graduation, this course is designed to widen background in transmission technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of transmission systems applications. The course is meant to create the deep understanding of the basics and theories behind the modern transmission systems applications. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to transmission systems.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to transmission systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using transmission systems applications.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to transmission systems.
5. Identify current problems and find solutions for it using transmission systems.
6. Apply the methodologies of scientific research and the use of its different tools in the area of transmission systems.
7. Relate the specialized knowledge to the industrial area of transmission systems.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the main differences between different transmission lines. a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the Audio frequency systems. a1-2-3 Describe the main differences between pair lines and coaxial carrier systems. a1-2-4 Discuss line system reliability. a1-2-5Explain submarine cable systems and pulse code modulation systems.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to radio systems, satellite communication systems and communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the transmission systems problems.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to transmission systems, using latest engineering techniques, skills, and tools.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge in transmission systems.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Line transmission.	12	12	-	--
2. Audio frequency systems.	12	12	-	--
3. Carrier systems for pair, type lines.	12	12	-	--

4. Coaxial cable carrier systems.	12	12	-	--
5. Line system reliability.	9	9	-	--
6. Submarine cable systems, pulse code modulation systems.	12	12	-	--
7. Radio systems, satellite communication systems.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2, A3-1	B1-1	C1-1	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Discretionry subjects**	**Total**
---	---	30%	70%	-			100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Line transmission.	1-4
2nd	Audio frequency systems.	5-8
3rd	Carrier systems for pair, type lines.	9-12
4th	Coaxial cable carrier systems.	13-16
5th	Line system reliability.	17-19
6th	Submarine cable systems, pulse code modulation systems.	20-23
7th	Radio systems, satellite communication systems.	24-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	Knowledge & Understanding						

a1-2-1 Describe the main differences between different transmission lines.	x						
a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the audio frequency systems.		x					
a1-2-3 Describe the main differences between pair lines and coaxial carrier systems.			x	x			
a1-2-4 Discuss line system reliability.					x		
a1-2-5 Explain submarine cable systems and pulse code modulation systems.						x	
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to radio systems, satellite communication systems and communication systems.							x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the digital signal processing problems.	x	x	x	x	x	x	x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to digital signal processing problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	x
d5-1-1 Use state-of-the-art computer and Internet tools for getting latest information and standards related to digital signal processing systems.						x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								

	a1-2-4	x				x								
	a1-2-5	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1					x								
Professional Skills	c1-1-1			x		x								
General Skills	d5-1-1		d	x					x					

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. David R. Smith,"Digital Transmission Systems,"Springer, 2004.
2. IEEE Standards.

12- Program Coordination Committee:

Course Coordinator: **Dr. Dr. Heba Y. Soliman**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 608
Network Planning
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Network Planning	**Code Symbol: ECE608**	
Lecture	**3 hours**	
Tutorial/ Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the student with the fundamentals of Stages in Planning. This course will also provide the students with the ability to understand Present Network Knowledge and network standards. It is also aimed that the student will get acquainted with Routing Plan, Grade of Services, Local Area Planning, and Growth Planning. It will provide the students with the ability to analyze network performance, and simulate the network.

2- Course Objectives:

The main Objectives of this course are to:

1- Demonstrate the knowledge and understanding of the fundamentals of Stages in Planning.
2- Define the Network Standards.
3- Demonstrate the Local Area Planning, and Growth Planning.
4- Recognize the Grade of Services.
5- Simulate and analyze the network performance.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the present network knowledge and planning stages. a1-2-2 Recognize the network and signaling Standards. a1-2-3 Discuss the routing plan techniques and the grade of services

	a1-2-4 Ilustrate the Local Area and Growth Planning methodologies.. a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of Testing, configuring and simulating a network.
A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	a4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field by doingnew Research points on the computer networks.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate analytic thinking approach to solve problems related to network planning. b1-1-2 Interpret, analyze, and evaluate a network specification information
C. Professional and practical skills	
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational tools includingpertaining software packages to analysis and design a process, component, or system related to the computer networks.
D. General and transferrable skills	
D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	d6-1-1 Demonstrate significantly enhanced group working abilities to implement a certain project.
D7-1Demonstrate a high level of competence in the time management.	d7-1-1 Manage time and work to deadlines.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Search about the recent work in the field of computer networks.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
Stages in Planning	9	9	--
Present Network Knowledge	9	9	--
Network Standards, and Signaling Standards	9	9	--

Routing Plan	9	9	--
Grade of Services	9	9	--
Local Area Planning	9	9	--
Growth Planning.	9	9	--
Testing, Configuring and Simulating the network	9	9	--
New Research points on the computer networks	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A4-1	B1-1	C1-2	D6-1, D7-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---		70%	30%	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	Stages in Planning	1-3
2nd	Present Network Knowledge	4-6
3rd	Network Standards, and Signaling Standards	7-9
4th	Routing Plan	10-12
5th	Grade of Services	13-15
6th	Local Area Planning	16-18
7th	Growth Planning.	19-21
8th	Testing, Configuring and Simulating the network	22-24
9th	New Research points on the computer networks	25-28

8- ILOs Matrix Topics:

Course Intended Learning Outcomes (ILOs)		Course topics								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Knowledge & Understanding	a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the present network knowledge and planning stages.	**x**	**x**							
	a1-2-2 Recognize the network and signaling standards.			**x**						
	a1-2-3 Discuss the routing plan techniques and the grade of services				**x**	**x**				
	a1-2-4 Ilustrate the Local Area and Growth Planning methodologies.						**x**	**x**		
	a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of Testing, configuring and simulating a network.								**x**	
	a4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field by doingnew Research points on the computer networks.									**x**
Intellectual Skills	b1-1-1Demonstrate analytic thinking approach to solve problems related to network planning.				**x**		**x**	**x**	**x**	**x**
	b1-1-2 Interpret, analyze, and evaluate a network specification information					**x**			**x**	
Professional Skill	c1-2-1 Use a wide range of computational tools includingpertaining software packages to analysis and design a process, component, or system related to the computer networks..								**x**	**x**

General Skills	d6-1-1 Demonstrate significantly enhanced group working abilities to implement a certain project.									**x**
	d7-1-1 Manage time and work to deadlines.									**x**
	d8-1-1 Search about the recent work in the field of computer networks									**x**

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a4-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b1-1-2	x				x								
Professional Skills	c1-2-1			x									x	
General Skills	d6-1-1		x	x					x	x				
	d7-1-1		x	x					x	x				
	d8-1-1		x	x					x	x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the lectures (class) or/and at home..

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

11.1- Essential books (text books)

1- M. D. Prycker, Asynchronous Transfer Mode Solution for Broadband ISDN. Englewood Cliffs, NJ: Prentice-Hall, 1995.

2- W. Stallings, Data and Computer Communications. Upper Saddle River, NJ: Prentice-Hall, 1997.

3- S. Tanenbaur, Computer Networks. Upper Saddle River, NJ: Prentice-Hall, 1996.

4- R. O. Onvural, Asynchronous Transfer Mode Networks Performance Issues. Boston: Artech House, 2001.

5- W. Buchanan, Advanced Data Communications and Networks. London: Chapman & Hall, 2003.

6- W. Stallings, High-Speed Networks: TCP/IP and ATM Design Principles. Upper Saddle River, NJ: Prentice-Hall, 1998.

7- M. Schwartz, Broadband Integrated Networks. Upper Saddle River, NJ: Prentice-Hall, 2002.

11.2- Web sites

"NS-2 Network Simulator" http://www.isi.edu/nsnam/ns/

13- Program Coordination Committee:

Course Coordinator:	**Prof. Dr. Rawya Yehia Rizk**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: / 10/2020

ECE 609
Local Area Network
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Local Area Networks	**Code Symbol: ECE609**	
Lecture	**3 hours**	
Tutorial/ Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the student with the fundamentals of computer networks and their applications. This course will also provide the students with the ability to understand Carrier Sense Multiple Access/Collision Detection Protocol, differentiate between network connection models, and understand Transfer models. It is also aimed that the student will get acquainted with Metropolitan Growth Planning. It will provide the students with the ability to analyze network performance, and simulate the network.

2- Course Objectives:

The main Objectives of this course are to:

1- Demonstrate the knowledge and understanding of the fundamentals of computer networks and their applications.
2- Define the Network architecture, and Carrier Sense Multiple Access/Collision Detection Protocols.
3- Demonstrate the Metropolitan Growth Planning.
4- Recognize the different types of topologies, switching techniques, and communication media.
5- Simulate and analyze the network performance.

3- Intended Learning Outcomes (ILOs):

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofThe key components of the local area networks and the characteristics of network architecture: fault tolerance, scalability and quality of services a1-2-2 Recognize the layered network architecture and standard network models (OSI

	and TCP/IP). a1-2-3 Discuss functionality and protocols of application, transports, and network layers of OSI model. a1-2-4 Discuss data link layer protocols, the media access control methods, the network topologies, and encapsulation. a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofthe physical layer protocols and services , signaling, encoding, and the common media. a1-2-6 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of Testing, configuring and simulating a network.
A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	a4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field by doingnew Research points on the computer networks.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate analytic thinking approach to solve problems related to network planning. b1-1-2 Interpret, analyze, and evaluate a network specification information
C. Professional and practical skills	
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational tools including pertaining software packages to analysis and design a process, component, or system related to the computer networks.
D. General and transferrable skills	
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Search about the recent work in the field of computer networks.

4- Course Contents:

No.	*Topic*	*Total hours*	*Lec. hours*	*Tut. hours*
1	The key components of data networks and the characteristics of network architecture: fault tolerance, scalability, and quality of services.	9	9	-

2	Layered network architecture and standard network models (OSI and TCP/IP)	9	9	-
3	Application layer functionality and protocols	9	9	-
4	Transport layer protocols (TCP and UDP), error handling, and reliability	9	9	-
5	Network layer protocols (IPv4 and IPv6), the principles of grouping and division of devices, Addressing the Network-IPv4, classification of networks.	9	9	-
6	Data link layer protocols, the media access control methods, the network topologies, and encapsulation.	9	9	-
7	Physical layer protocols and services, signaling, encoding, and the common media.	9	9	-
8	Planning, Testing, Configuring and Simulating the network	9	9	-
9	New Research points on the computer networks	12	12	-
Total		84	84	-

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2, A4-1	B1-1	C1-2	D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	-	70%	30%			100%

7- Course Topics.

Topic No.	Topic	Weeks
1	The key components of data networks and the characteristics of network architecture: fault tolerance, scalability, and quality of services.	1-3
2	Layered network architecture and standard network models (OSI and TCP/IP)	4-6
3	Application layer functionality and protocols	7-9

4	Transport layer protocols (TCP and UDP), error handling, and reliability	10-12
5	Network layer protocols (IPv4 and IPv6), the principles of grouping and division of devices, Addressing the Network-IPv4, classification of networks.	13-15
6	Data link layer protocols, the media access control methods, the network topologies, and encapsulation.	16-18
7	Physical layer protocols and services, signaling, encoding, and the common media.	19-21
8	Planning, Testing, Configuring and Simulating the network	22-24
9	New Research points on the computer networks	25-28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics								
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**
Knowledge & Understanding	a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofThe key components of the local area networks and the characteristics of network architecture: fault tolerance, scalability and quality of services	**X**								
	a1-2-2 Recognize the layered network architecture and standard network models (OSI and TCP/IP).		**X**							
	a1-2-3 Discuss functionality and protocols of application, transports, and network layers of OSI model.			**X**	**X**	**X**				
	a1-2-4 Discuss data link layer protocols, the media access control methods, the network topologies, and encapsulation.						**X**			
	a1-2-5 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofthe physical layer protocols and services , signaling, encoding, and the common media..							**X**		

	a1-2-6 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of Testing, configuring and simulating a network								**x**	
	a4-1-1 Gain a depth of knowledge, understanding and fundamentals of ethical & legal professional practice of scientific research in the field by doingnew Research points on the computer networks.									**x**
Intellectual Skills	b1-1-1 Demonstrate analytic thinking approach to solve Solve the addressing problems.					**x**	**x**	**x**	**x**	**x**
	b1-1-2 Interpret, analyze, and evaluate the performance of the network.				**x**				**x**	**x**
Professional Skill	c1-2-1 Use software packages to simulate the network.								**x**	**x**
General Skills	d8-1-1 Search about the recent work in the field of computer networks.								**x**	**x**

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a4-1-1	x				x								
Intellectual Skills	b1-1-1	x				x								
	b1-1-2	x				x								
Professional Skills	c1-2-1			x									x	
General Skills	d8-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Whiteboard – Class Room Equipped with Computer and Video Projector - Computer Lab - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using computer labs during the lectures and at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports.

12- List of references:

12.1- Essential books (text books)

1- M. D. Prycker, *Asynchronous Transfer Mode Solution for Broadband ISDN*. Englewood Cliffs, NJ: Prentice-Hall, 1995.
2- W. Stallings, *Data and Computer Communications.* Upper Saddle River, NJ: Prentice-Hall, 1997.
3- S. Tanenbaur, *Computer Networks*. Upper Saddle River, NJ: Prentice-Hall, 1996.
4- R. O. Onvural, *Asynchronous Transfer Mode Networks Performance Issues*. Boston: Artech House, 2001.
5- W. Buchanan, *Advanced Data Communications and Networks*. London: Chapman & Hall, 2003.
6- W. Stallings, *High-Speed Networks: TCP/IP and ATM Design Principles.* Upper Saddle River, NJ: Prentice-Hall, 1998.
7- M. Schwartz, *Broadband Integrated Networks*. Upper Saddle River, NJ: Prentice-Hall, 2002.

12.2- Web sites

"NS-2 Network Simulator" http://www.isi.edu/nsnam/ns/

13- Program Coordination Committee:

Course Coordinator: **Prof. Dr. Rawya Yehia Rizk**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 610
Antennas
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Antennas	**Code Symbol: ECE610**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in antenna engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in antennas and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of antenna engineering. The course is meant to create the deep understanding of the physics behind the phenomena of radiation and reception of electromagnetic waves by antennas. The course is meant also to enhance the ability of the student to integrate the proper antenna in various communication systems. Emphasis will be on the recent antenna types and advanced methods of analysis and synthesis.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to antenna engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to antenna systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using antennas.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to antenna systems.
5. Identify current problems and find solutions for it using antennas in the area of communication systems.
6. Compare the methodologies of scientific research and the use of its different tools in the area of antennas.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of antennas.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Recognize the radiation phenomenon of the antenna. a1-2-2 Recognize the wave reception by the antenna. a1-2-3 Classify the antennas according to their physical structure and properties. a1-2-4 Discuss the main methods of analysis and design of the antennas.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of antenna applications.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to antenna field.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the antenna problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to antennas.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for antennas development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to antenna problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on integrated antenna systems.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about antenna types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain	d8-1-1 Exhibit the ability to learn more about antennas.

their technical competency.	

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**
1. Revision on the undergraduate materials related to the antennas	6	6	-	--
2. Radiation Integrals and Auxiliary Potential Functions	6	6	-	--
3. Antenna Arrays: Linear, Planar, and Circular	9	9	-	--
4. Antenna Synthesis	9	9	-	--
5. Integral Equations, Moment Method, and Self and Mutual Impedances	9	9	-	--
6. Broadband Dipoles and Matching Techniques	9	9	-	--
7. Traveling Wave and Broadband Antennas	9	9	-	--
8. Frequency Independent Antennas,and Antenna Miniaturization	9	9	-	--
9. Aperture antennas	9	9	-	--
10. Microstrip and planar antennas	9	9	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to the antennas	1-2
2nd	Radiation Integrals and Auxiliary Potential Functions	3-4

3rd	Antenna Arrays: Linear, Planar, and Circular	5-7
4th	Antenna Synthesis	8-10
5th	Integral Equations, Moment Method, and Self and Mutual Impedances	11-13
6th	Broadband Dipoles and Matching Techniques	14-16
7th	Traveling Wave and Broadband Antennas	17-19
8th	Frequency Independent Antennas, and Antenna Miniaturization	20-22
9th	Aperture antennas	23-25
10th	Microstrip and planar antennas	26-28

8- ILOs Matrix Topics

Course ILOs	**Course topics**									
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**
a1-2-1 Recognize the radiation phenomenon of the antenna.	x	x					x		x	x
a1-2-2 Recognize the wave reception by the antenna.	x	x			x		x		x	x
a1-2-3 Classify the antennas according to their physical structure and properties.	x		x	x		x	x	x	x	x
a1-2-4 Discuss the main methods of analysis and design of the antennas.	x	x	x	x	x	x	x	x	x	x
a2-1-1 Report and discuss social effects of antenna applications.		x	x						x	
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to antenna field.			x	x		x			x	x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the antenna problems.	x	x	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to antennas.			x	x	x	x		x		
b5-1-1 Evaluate pros and cons of given methodologies for antennas development.			x	x	x	x	x	x	x	x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to antenna problems, using latest engineering techniques, skills, and tools.			x	x	x	x	x	x	x	x

c2-1-1 Write and evaluate a professional report on integrated antenna systems.										x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about antenna types and technology.			x			x	x	x	x	
d8-1-1 Exhibit the ability to learn more about antennas.	x		x	x	x		x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. C. A. Balanis, "Antenna Theory – Analysis and Design," John Wiley & Sons, 2005.

2. W. L. Stutzman and G. A. Thiele, " Antenna Theory and Design," John Wiley & Sons, 1998.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Heba Y. Soliman**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE-611

Microwave Electronics

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Microwave Electronics	**Code Symbol: ECE611**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in microwave electronics. For those students who look toward an industrial position after graduation, this course is designed to widen background in microwave electronics and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of microwave electronics. The course is meant to create the deep understanding of the physics behind the phenomena of generation and amplification of microwave signals by microwave electronic active devices. The course is meant also to enhance the ability of the student to integrate the proper microwave electronic device in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to microwave electronics.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to microwave electronic circuits and systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using microwave electronic components.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to microwave electronic systems.
5. Identify current problems and find solutions for it using microwave electronic components in the area of communication systems.
6. Compare the methodologies of scientific research and the use of its different tools in the area of microwave electronics.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of microwave electronics.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the electron motion in atoms and crystals. a1-2-2 Recognize the energy band structure for compound semiconductors. a1-2-3 Recognize the differences between microwave electronic devices and other electronic devices operating at lower frequencies.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of microwave electronics applications.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of new types of microwave electronic devices in advanced electronics and communication systems.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different microwave electronic components and systems development phases
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the microwave electronics problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwave electronics.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for microwave electronic component development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to microwave problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on microwave amplifiers.

D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave electronic components and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about microwave electronics.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Revision on the undergraduate materials related to electronics	6	6	-	--
2. Revision on the undergraduate materials related to Microwaves	6	6	-	--
3. Passive microwave diodes	9	9	-	--
4. Avalanch diode	6	6	-	--
5. Gunn device	9	9	-	--
6. IMPATT diodes	9	9	-	--
7. Microwave transistors	9	9	-	--
8. Microwave amplifiers	12	12	-	--
9. Microwave oscillators	9	9	-	--
10. Microwave mixers	9	9	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to electronics	1-2
2nd	Revision on the undergraduate materials related to Microwaves	3-4
3rd	Passive microwave diodes	5-7
4th	Avalanche diode	8-9
5th	Gunn device	10-12
6th	IMPATT diodes	13-15
7th	Microwave transistors	16-18
8th	Microwave amplifiers	29-22
9th	Microwave oscillators	23-25
10th	Microwave mixers	26-28

8- ILOs Matrix Topics

Course ILOs	**Course topics**									
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	**10th**
a1-2-1 Describe the electron motion in atoms and crystals.	x		x	x	x	x	x			
a1-2-2 Recognize the energy band structure for compound semiconductors.	x		x	x	x	x	x			
a1-2-3 Recognize the differences between microwave electronic devices and other electronic devices operating at lower frequencies.		x	x	x	x	x	x	x		
a2-1-1 Report and discuss social effects of microwave electronics applications.		x	x				x	x	x	
a3-1-1 Classify the Potential applications of new types of microwave electronic devices in advanced electronics and communication systems.			x				x	x	x	x
a5-1-1 Explain Quality Assurance concepts of different microwave electronic components and systems development phases.								x		
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the microwave electronics problems.	x	x	x	x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwave electronics.							x	x		
b5-1-1 Evaluate pros and cons of given methodologies for microwave electronic component development.			x	x	x	x	x	x	x	x

c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to microwave problems, using latest engineering techniques, skills, and tools.			x				x	x	x	x
c2-1-1 Write and evaluate a professional report on microwave amplifiers.								x		
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave electronic components and technology.								x	x	x
d8-1-1 Exhibit the ability to learn more about microwave electronics.	x		x	x	x	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer	Practical
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1		x							x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
. General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment
10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions-Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. I. A. Glover, S. R. Pennock and P. R. Shepherd,“ Microwave Devices, Circuits and Subsystems for Communications Engineering,“ John Wiley & Sons, 2005.

2. David M. Pozar, ” Microwave Engineering,” John Wiley & Sons, 2005.

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif Sharosh**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE-612

Planar Microwave Circuits

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Planar Microwave Circuits	**Code Symbol: ECE612**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in microwave planar circuits engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in planar microwave technology and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of planar microwave circuits engineering. The course is meant to create the deep understanding of the physics behind the phenomena of guided wave propagation in different planar microwave structures. The course is meant also to enhance the ability of the student to integrate the proper planar microwave component in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to planar microwave circuits engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to planar microwave circuits and systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using planar microwave components.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to microwave systems.
5. Identify current problems and find solutions for it using planar microwave components in the area of communication systems.
6. Compare the methodologies of scientific research and the use of its different tools in the area of planar microwave circuits engineering.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of planar microwave circuits.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the microwave propagation in planar guiding structures. a1-2-2 Recognize the methods of analysis for planar microwave circuits. a1-2-3 Recognize the differences between microstrip circuits components and other components operating at lower frequencies.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of planar microwave circuits applications.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of new types of planar microwave devices in advanced electronics and communication systems.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different planar microwave components and systems development phases
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the planar microwave circuits problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to planar microwave circuits.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for planar microwave component development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to planar microwave circuits problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on microstrip filters.
D. General and transferrable skills	

D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about planar microwave components and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about planar microwave circuits techniques.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Revision on the undergraduate materials related to microstrip lines and circuits	12	12	-	--
2. Analysis of planar microwave circuits	12	12	-	--
3. Use of planar circuits in design of passive microwave devices	12	12	-	--
4. Micrpstrip power dividers and couplers	12	12	-	--
5. Impedance transformers	9	9	-	--
6. Micrpstrip filters	12	12	-	--
7. Use of planar circuits in design of active microwave devices such as detectors, mixers and amplifiers	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B3-1, B5-1	C1-1,C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-			100%

7- Course Topics.

Topic No.	Topic	Weeks

1st	Revision on the undergraduate materials related to microstrip lines and circuits	1-4
2nd	Analysis of planar microwave circuits	5-8
3rd	Use of planar circuits in design of passive microwave devices	9-12
4th	Micrpstrip power dividers and couplers	13-16
5th	Impedance transformers	17-19
6th	Micrpstrip filters	20-23
7th	Use of planar circuits in design of active microwave devices such as detectors, mixers and amplifiers	24-28

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Describe the microwave propagation in planar guiding structures.	x		x				
a1-2-2 Recognize the methods of analysis for planar microwave circuits.	x	x	x				x
a1-2-3 Recognize the differences between microstrip circuits components and other components operating at lower frequencies.	x	x	x	x	x	x	
a2-1-1 Report and discuss social effects of planar microwave circuits applications.	x						
a3-1-1 Classify the Potential applications of new types of planar microwave devices in advanced electronics and communication systems.			x	x	x	x	x
a5-1-1 Explain Quality Assurance concepts of different planar microwave components and systems development phases		x	x			x	x
Course ILOs	**Intellectual skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the planar microwave circuits problems.	x	x					x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to planar microwave circuits.		x					x
b5-1-1 Evaluate pros and cons of given methodologies for planar microwave component development.		x	x	x	x	x	x
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing,		x				x	x

and creating engineering solutions related to planar microwave circuits problems, using latest engineering techniques, skills, and tools.							
c2-1-1 Write and evaluate a professional report on microstrip filters.						x	
Course ILOs	**General and transferrable skills**						
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about planar microwave components and technology.			x				x
d8-1-1 Exhibit the ability to learn more about planar microwave circuits techniques.			x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer**	**Practical**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1		x							x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
. General skills	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week

Final Examination	100	30
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. E. H. Fooks,and R.A. Zakarevicius " Microwave Engineering Using Microstrip Circuits," Printice Hall, 1990.
2. Jia-Sheng Hong, and M. J. Lancaster, " Microstrip Filters for RF/Microwave Applications," John Wiley & Sons, 2001.
3. Noyan Kinayman, and M. I. Aksun, "Modern Microwave Circuits," Artech House, 2005

13- Program Coordination Committee:

Course Coordinator: **Associate Prof Dr. Sherif Sharosh**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 613

Opto - Electronics Engineering

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Opto - Electronics Engineering	**Code Symbol: ECE 613**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in optoelectronics and principles of the optoelectronic devices operation. This course provides the background in optoelectronics, help students meet the demand of growing semiconductor optoelectronic industry and prepares them to advanced study and research in the semiconductor optics and optoelectronics devices and to be familiar with recent trends in optoelectronics. The covered topics relate to: basic semiconductor optical properties, hetero-junctions optical materials, analysis and design of LED for Optical communication, principles of laser action and theory of semiconductor laser.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to opto-electronic engineering field.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to opto-electronic engineering field.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using opto-electronic materials and devices.
4. Build the skills that necessary to identify and solve complex and open ended engineering problems related to optical electronic components and subsystems design and implementation.
5. Compare the methodologies of scientific research and the use of its different tools in the area of opto-electronic engineering.
6. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of opto-electronic engineering

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic semiconductor optical properties. a1-2-2 Classify the basic semiconductor optical devices according to their physical structure and properties. a1-2-3 Classify the hetero-Junctions optical materials according to their physical structure and properties. a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding to the principles of LD Action. a1-2-5 Describe different effective techniques and methods to analyze and design different types of LED for Optical Communication. a1-2-6 Demonstrate sufficient essential knowledge and a deep understanding to the principles of Laser Action. a1-2-7 Explain the theory of Semiconductor Laser with emphasis on their physical structure, properties, and applications. a1-2-8 Demonstrate a basic understanding of the Quantum Well Lasers.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of Optical Electronics and Communications field.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of Optical Electronics and Communications field.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems development phases.
B. Intellectual skills	
B1-1 Apply the analytical approaches and	b1-1-1 Demonstrate an investigatory and analytic

its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	thinking approach (Problem solving) to solve problems related to Optical Electronics and Communications and its applications.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 identify and apply appropriate methods for discrimination of physics-based optical device models in the context of specific technological constraints .
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Optical Electronics and Communications and its applications.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical Electronics and Communications systems problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on semiconductor optical properties.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems.

4-Course Contents

Lecture Topic	**Total Hours**	**Lecture Hours**	**Practical /Tutorial Hours**
1- Basic Semiconductor Optical Properties.	18	18	--

2- Hetero-Junctions Optical Materials.	12	12	--
3- Principles of LD Action.	12	12	--
4- Analysis and Design of LED for Optical Communication.	12	12	--
5- Principles of Laser Action.	12	12	--
6- Theory of Semiconductor Laser.	12	12	--
7- Quantum Well Lasers.	6	6	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B2-1, B3-1, B5-1	C1-1,C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Basic Semiconductor Optical Properties.	**1-6**
2nd	2- Hetero-Junctions Optical Materials.	**7-10**
3rd	3- Principles of LD Action.	**11-14**
4th	4- Analysis and Design of LED for Optical Communication.	**15-18**
5th	5- Principles of Laser Action.	**19-22**
6th	6- Theory of Semiconductor Laser and applications.	**23-26**
7th	7- Quantum Well Lasers.	**27-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						

a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic semiconductor optical properties.	x						
a1-2-2 Classify the basic semiconductor optical devices according to their physical structure and properties.	x	x					
a1-2-3 Classify the hetero-Junctions optical materials according to their physical structure and properties.		x					
a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding to the principles of LD Action.			x				
a1-2-5 Describe different effective techniques and methods to analyze and design different types of LED for optical communication.				x			
a1-2-6 Demonstrate sufficient essential knowledge and a deep understanding to the principles of Laser Action.					x		
a1-2-7 Explain the theory of Semiconductor Laser with emphasis on their physical structure, properties, and applications.						x	
a1-2-8 Demonstrate a basic understanding of the Quantum Well Lasers.							x
a2-1-1 Report and discuss social effects of Optical Electronics and Communications field.	x	x					
a3-1-1 Classify the Potential applications of Optical Electronics and Communications field.				x		x	
a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems development phases.				x	x	x	x
Course ILOs	**Intellectual Skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Optical Electronics and Communications and its applications.	x	x	x	x	x	x	x
b2-1-1 identify and apply appropriate methods for discrimination of physics-based optical device models in the context of specific technological constraints .				x		x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Optical Electronics and Communications and its applications.				x		x	x
b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems development.				x		x	x
Course ILOs	**Professional Skill**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating				x		x	

engineering solutions related to optical Electronics and Communications systems problems, using latest engineering techniques, skills, and tools.						
c2-1-1 Write and evaluate a professional report on Photonic semiconductor materials.	x					x
Course ILOs	**General Skills**					
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.						x
d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems.						x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1									x		x		
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1				x	x				x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d5-1-1		x							x				
	d8-1-1		x							x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Joseph T. Verdeyen., "Laser Electronics", Prentice-Hall Inc., 1993.
- Pallab Bhattacharya " Semiconductor Optoelectronics Devices", Prentice Hill, Second Edition, 1996.
- Clifford R. Pollock, "Fundamentals of Optoelectronics", Richard D. Irwin Inc., 1994
- **J. Singh, "Electronic and Optoelectronic Properties of Semiconductor Structures," Cambridge University Press, 2003**.

Recommended Books:

- Wallace B. Leigh, "Device for Optoelectronics", CRC, 1966.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Rania M. Abd Allah**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 614

Integrated Optics Engineering

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Integrated Optics Engineering	**Code Symbol: ECE 614**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in Opto-Electronics and Photonic. The main objective of the course is to familiarize the students with the fundamental aspects of integrated optics. This course is designed to widen student's background in Opto-Electronics engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of Photonic Electronics science. The covered topics relate to : analysis and design of openandsymmetric Slab wave-guide, multi-layer wave-guide, graded index wave-guide; also included are integrated optics fabrication and characterization techniques.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and fabrication and characterization techniques relevant to integrated optical components and systems.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to optics engineering field.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications design using integrated opto-electronic and wave guides.
4. Identify and solve complex and open ended engineering problems related to optical electronic components and subsystems design and implementation.
5. Compare the methodologies of scientific research and the use of its different tools in the area of integrated optics.
6. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of integrated optics.
7. Analyze simple channel waveguides

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning**

Outcomes (ILOs):

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Classify the different types of the wave-guidesbased on their physical structure, properties, principles of operations, and applications. a1-2-2 Demonstrate sufficient essential knowledge and a deep understanding to analyze and design different types of Wave-Guides a1-2-3 Describe different effective techniques and methods, such as the WKB method, the Effective method, beam propagation method, to analyze and design optical wave guides. a1-2-4 Explain the two dimensional wave-guide physical structure, concepts, and properties. a1-2-5 Classify the basic integrated optical components according to their physical structure, properties, and applications. a1-2-6 Discuss the basics integrated optics fabrication techniques. a1-2-7 Explain the most important integrated optics characterization techniques. a1-2-8 Demonstrate a basic understanding of the devices used in optoelectronic integrated circuits and optical signal processing.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of Optical Electronics and Communications field.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of Optical Electronics and Communications field.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems development phases.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Optical Electronics and Communications and its applications.

Engineering.	
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 identify and apply appropriate methods for discrimination of physics-based integrated optical device models in the context of specific technological constraints .
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Optical Electronics and Communications and its applications.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical Electronics and Communications systems problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on Photonic semiconductor materials.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Analysis of Open Wave-Guides.	12	12	--
2- Symmetric Slab Wave-Guide.	6	6	--
3- Multi Layer Wave-Guide Graded Index Wave-Guide.	6	6	--
4- The WKB Method.	6	6	--
5- Two Dimensional Wave-Guide.	6	6	--
6- The Effective Index Method (EIM).	6	6	--

7- Integrated Optical Components.	12	12	--
8- Beam Propagation Method.	6	6	--
9- Fabrication Techniques.	6	6	--
10- Characterization Techniques.	6	6	--
11- Integrated Opto-Electronic.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2,A2-1, A3-1, A5-1	B1-1, B2-1, B3-1, B5-1	C1-1,C2-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1**-** Analysis of Open Wave-Guides**.**	**1-4**
2nd	2- Symmetric Slab Wave-Guide.	**5-6**
3rd	3- Multi Layer Wave-Guide Graded Index Wave-Guide.	**7-8**
4th	4- The WKB Method.	**9-10**
5th	5- Two Dimensional Wave-Guide.	**11-12**
6th	6- The Effective Index Method (EIM).	**13-14**
7th	7- Integrated Optical Components.	**15-18**
8th	8- Beam Propagation Method.	**19-20**
9th	9- Fabrication Techniques.	**21-22**
10th	10- Characterization Techniques.	**23-24**
11th	11- Integrated Opto-Electronic.	**25-28**

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th
Course ILOs	**Knowledge & Understanding**										
a1-2-1 Classify the different types of the wave-guidesbased on their physical structure, properties, principles of operations, and applications.	x	x	x								
a1-2-2 Demonstrate sufficient essential knowledge and a deep understanding to analyze and design different types of Wave-Guides.	x	x	x								
a1-2-3 Describe different effective techniques and methods, such as the WKB method, the Effective method, beam propagation method, to analyze and design optical wave guides.				x		x		x			
a1-2-4 Explain the two dimensional wave-guide physical structure, concepts, and properties.					x						
a1-2-5 Classify the basic integrated optical components according to their physical structure, properties, and applications.							x				
a1-2-6 Discuss the basics integrated optics fabrication techniques.									x		
a1-2-7 Explain the most important integrated optics characterization techniques.										x	
a1-2-8 Demonstrate a basic understanding of the devices used in optoelectronic integrated circuits and optical signal processing.											x
a2-1-1 Report and discuss social effects of Optical Electronics and Communications field.											x
a3-1-1 Classify the Potential applications of Optical Electronics and Communications field.											x
a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems development phases.									x		x
Course ILOs	**Intellectual Skills**										
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to Optical Electronics and Communications and its applications.	x	x	x	x	x	x	x	x	x	x	x

b2-1-1 identify and apply appropriate methods for discrimination of physics-based integrated optical device models in the context of specific technological constraints .				x		x		x			
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to Optical Electronics and Communications and its applications.				x		x		x			
b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems development.				x		x		x			
Course ILOs	**Professional Skill**										
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical Electronics and Communications systems problems, using latest engineering techniques, skills, and tools.				x		x		x			
c2-1-1 Write and evaluate a professional report on Photonic semiconductor materials.											x
Course ILOs	General Skills										
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.									x	x	
d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems.											x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								

	a1-2-6	x			x	x								
	a1-2-7	x			x	x								
	a1-2-8	x			x	x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1									x		x		
Intellectual Skills	b1-1-1				x	x								
	b2-1-1				x	x								
	b3-1-1				x	x								
	b5-1-1				x	x				x				
Professional Skills	c1-1-1				x	x								
	c2-1-1		x	x					x					
	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Robert G. Hunsperger, "Integrated Optics", Springer., Fifth Edition, 2002.
- Reinhard Marz, "Integrated Optics: Design and Modeling", Artech House Publisher, 1995.

Recommended Books:

- Clifford R. Pollock, "Fundamentals of Optoelectronics", Richard D. Irwin Inc., 1994.

13- <u>Program Coordination Committee:</u>

Course Coordinator: **Associate Prof. Dr. Sherif M. Sharroush**

Program coordinator: **Assist. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

Quality Assurance & Accreditation Unit

ECE 615
Optical Measurements
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Optical Measurements	**Code Symbol: ECE 615**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts for the measurement of fast optical processes techniques and methods. Also, this course provides the background relating to the manufacturing and characterization techniquesof some types of optoelectronic devices and optical fiber measurements, help students meet the demand of growing semiconductor optoelectronic industry and prepares them to advanced study and research in the semiconductor optics and optoelectronics devices and to be familiar with recent trends in optoelectronics measurements. The students will gain sufficient background to deal with basic optical instrumentation, and to properly carry out measurements employing these instruments. The practical experience will come from the lab work, analysis and write up of the lab measurements.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced optical measurements facts, concepts, principles, techniques and measuring instruments.
2. Collect advanced skills to perform measurements for different optical wave-guides, devices, and systems.
3. Review tools, techniques, equipment and software relevant to optical measurements and how to use them efficiently.
4. Develop methods and use techniques, principles and laws of engineering science to present, evaluate, and interpret experimental data concern with an optical wave-guide, component, system , to develop lines of argument and make sound judgments in accordance with their basic theories and concepts.
5. Identify and categorize the experimental optical components to be built, constructs them on breadboard, and performs the experiment.
6. Compare the methodologies of scientific research and the use of its different tools in the area of optical measurements.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of optical measurements.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic concepts for the measurement of fast processes techniques and methods a1-2-2 Classify the basic concepts for the measurement of fast processes techniques and methods according to their use. a1-2-3 Describe different effective techniques and methods to measure of the intensity correlation function. a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding for measurement of The intensity cross correlation functions. a1-2-5 Demonstrate sufficient essential knowledge and a deep understanding to the principles of fluorescence measurement ultra-fast spectroscopy. a1-2-6 Classify the high resolution nonlinear optical spectroscopy measurements methods according to their measurements principles. a1-2-7 Describe Four Wave Mixing and Multi-Photon Spectroscopy measurements methods. a1-2-8 Explain and describe the most common optical fiber and LD measurements.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Report new advances in analysis and design methodologies in Optical Electronics and Communications measurements techniques.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems measurements techniques phases.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to**Optical Measurements.**

B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientificproblems..	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve practical problems related to Optical Electronics and Communications and its applications.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering..	b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems measurements.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, developing plans and creating engineering solutions related to optical Electronics and Communications systems measurement problems, using latest engineering techniques, skills, and tools.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Deal effectively with the skills that necessary to Use tools, techniques, and equipment relevant to optical wave-guide, device, and systems measurements c1-2-2 Deal effectively with the skills that necessary to identify, design, analysis and categorize the experimental optical components to be built, constructs them on breadboard, and performs the experiment.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on advanced measurement techniques for optical communication systems.
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	C3-1-1 Evaluate measurements methods, techniques and tools reported in this course.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems measurements techniques.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency..	d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems measurements.

4- <u>Course Contents</u>

Lecture Topic (The lecture willbedone Inside the Lab)	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Basic Concepts for the Measurement of Fast Processes Techniques and Methods:Sampling Techniques, Intervals Measurement as Spatial Displacement, Signal Conversion Correlation Methods, Limits for Time Resolution. Non Linear Optical Methods for Measuring Ultra-Short Light Pluses.	24	24	--
2- Measurement of The Intensity Correlation Function By Means of Second Harmonic Generation and Two Photon florescence.	12	12	--
3- Measurement Of Intensity Cross Correlation Functions.	6	6	--
4- Fluorescence Measurement Ultra-Fast Spectroscopy.	6	6	--
5- High Resolution Nonlinear Optical Spectroscopy Measurements Methods: Four Wave Mixing and Multi-Photon Spectroscopy.	12	12	
6- Optical Fiber Measurements.	12	12	
7- LD Measurements.	12	12	
Total	84	84	**--**

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2, A3-1, A5-1	B1-1, B3-1, B5-1	C1-1, C1-2, C2-1, C3-1	D5-1, D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**-**	**30**	**-**	**70**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Basic Concepts for the Measurement of Fast Processes Techniques and Methods:Sampling Techniques, Intervals Measurement as Spatial Displacement, Signal Conversion Correlation Methods, Limits for Time Resolution. Non Linear Optical Methods for Measuring Ultra-Short Light Pluses.	**1-8**
2nd	2- Measurement of The Intensity Correlation Function By Means of Second Harmonic Generation and Two Photon florescence.	**9-12**
3rd	3- Measurement Of Intensity Cross Correlation Functions.	**13-14**
4th	4- Fluorescence Measurement Ultra-Fast Spectroscopy.	**15-16**

5th	5- High Resolution Nonlinear Optical Spectroscopy Measurements Methods: Four Wave Mixing and Multi-Photon Spectroscopy.	**17-20**
6th	6- Optical Fiber Measurements.	**21-24**
7th	7- LD Measurements.	**25-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic concepts for the measurement of fast processes techniques and methods.	x						
a1-2-2 Classify the basic concepts for the measurement of fast processes techniques and methods according to their use.	x						
a1-2-3 Describe different effective techniques and methods to measure of the intensity correlation function.		x					
a1-2-4 Demonstrate sufficient essential knowledge and a deep understanding for measurement of the intensity cross correlation functions.			x				
a1-2-5 Demonstrate sufficient essential knowledge and a deep understanding to the principles of fluorescence measurement ultra-fast spectroscopy.				x			
a1-2-6 Classify the high resolution nonlinear optical spectroscopy measurements methods according to their measurements principles.					x		
a1-2-7 Describe Four Wave Mixing and Multi-Photon Spectroscopy measurements methods.					x		
a1-2-8 Explain and describe the most common optical fiber and LD measurements.						x	x
a3-1-1 Report new advances in analysis and design methodologies in Optical Electronics and Communications measurements techniques.						x	x
a5-1-1 Explain quality assurance concepts of optical Electronics and Communications systems measurements techniques phases.						x	x
Course ILOs	**Intellectual Skills**						
b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to**Optical Measurements.**						x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve practical problems related to Optical Electronics and						x	x

Communications and its applications.							
b5-1-1 Evaluate pros and cons of given methodologies for Optical Electronics and Communications systems measurements.	x	x	x	x			
Course ILOs	**Professional Skill**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, developing plans and creating engineering solutions related to optical Electronics and Communications systems measurement problems, using latest engineering techniques, skills, and tools.						x	x
c1-2-1 Deal effectively with the skills that necessary to use tools, techniques andequipment relevant to optical wave-guide, device, and systems measurements.						x	x
c1-2-2 Deal effectively with the skills that necessary to identify, design, analysis and categorize the experimental optical components to be built, constructs them on breadboard, and performs the experiment.						x	x
c2-1-1 Write and evaluate a professional report on advanced measurement techniques for optical communication systems.						x	x
c3-1-1 Evaluate measurements methods, techniques and tools reported in this course.	x	x	x	x	x	x	x
Course ILOs	**General Skills**						
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems measurements techniques.		x	x	x	x	x	x
d8-1-1 Exhibit the ability to learn more about optical Electronics and Communications systems measurements.		x	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method (The teching process will be done inside the Lab)**													
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								x
	a1-2-2	x				x								x

	a1-2-3	x				x								x
	a1-2-4	x				x								x
	a1-2-5	x				x								x
	a1-2-6	x				x								x
	a1-2-7	x				x								x
	a1-2-8	x				x								x
	a3-1-1			x					x	x				
	a5-1-1			x					x	x				
	b1-1-1					x								x
	b3-1-1					x								
	b5-1-1			x		x			x					
Professional Skills	c1-1-1					x								x
	c1-2-1								x					x
	c1-2-2								x					x
	c2-1-1		x	x					x					
	c3-1-1		x	x					x					x
	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector –Optical Measurement Practical Lab - Library.

A. laboratory Usage (During Lectures):

The teaching process will be done inside the Lab and the professor and thestudents are expected to prepare and conduct some practical experiments.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- <u>List of References:</u>

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Steve Vanlanduit and Patrick Guillaume, "Optical Measurements Techniques", Elsevier Ltd, 2008.

- Franz Mayinger and Oliver Feldmann, "Optical Measurements Techniques and Applications", Second Edition, Elsevier Ltd, 2001.

Recommended Books:

- Rongqing Hui and Maurice O'Sullivan "Fiber Optic Measurements Techniques" , Academic Press, 2008
- Pramod K. Rastogi, "Optical Measurements Techniques and Applications", Artech House Publisher, 1997.

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif M. Sharroush**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 616

Optical Wave Guide Engineering

Course Specification

Course Specification

Program on which the course is given:	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program:	**Major**
Department offering the program:	**Electrical Engineering**
Department offering the course:	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval:	**2020**

A- Basic Information

Title: Optical Wave Guide Engineering	**Code Symbol: ECE 616**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in optical engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in optical engineering and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in a variety of different areas of optical engineering and optical waveguides design.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to optical engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to optical waveguides.
3. Develop models and methods and use techniques, principles and laws of optical engineering in order to lead to optical waveguides design.
4. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of optical communications.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and	a1-2-1 Recognize the concepts of the most common asymmetric slide optical waveguides. a1-2-2 Classify the optical fibers according to their coefficients. a1-2-3 Describe the wave motion in waveguides.

Communication Engineering.	a1-2-4 Recognize the energy band structure and the lattice vibration. a1-2-5 Discuss the WKB method.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the Potential applications of optical waveguides in advanced electronics and communication systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to optical waveguides.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to optical waveguides.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems..	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical waveguide design.
D. General and transferrable skills	
D3-1 Apply self-evaluation and specify his educational needs related to electronics and communications aspects.	d3-1-1 Identify needs for new knowledge in the field of optical waveguides types and technology.
D4-1 Design standards to evaluate others performance.	d4-1-1 Demonstrate ability to critically evaluate other people's performance in a systematic and standard way.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical waveguides types and technology.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Optical communications systems.	6	6	--
2- The use of optical waveguides.	6	6	--
3- Asymmetric slide waveguide.	6	6	--
4-Types of optical waveguides.	6	6	--
5- Refractive index.	6	6	--
6- WKB method.	6	6	--
7- WKB method.	6	6	--
8- Wave processing.	12	12	--
9- Dispersion.	12	12	--
10- Attenuation.	6	6	--
11 - Detection.	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1-2, A3-1**	**B1-1, B3-1**	**C1-1**	**D3-1, D4-1, D5-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**	**-**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Optical communications systems.	**1-2**
2nd	The use of optical waveguides.	**3-4**
3rd	Types of optical waveguides Asymmetric slide waveguide.	**5-8**
4th	Refractive index.	**9-10**

5th	WKB method.	**11-14**
6th	Wave processing.	**15-18**
7th	Dispersion.	**19-22**
8th	Attenuation.	**23-24**
9th	Detection.	**25-28**

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**
Course ILOs	**Knowledge & Understanding**								
a1-2-1 Recognize the concepts of the most common asymmetric slide optical waveguides.			x						
a1-2-2 Classify the optical fibers according to their coefficients.		x	x	x					
a1-5-3 Describe the wave motion in waveguides.		x	x			x	x	x	x
a1-2-4 Recognize the energy band structure and the lattice vibration.		x	x	x					
a1-2-5 Discuss the WKB method.					x				
a3-1-1 Classify the Potential applications of optical waveguides in advanced electronics and communication systems.	x	x							
Course ILOs	**Intellectual Skills**								
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve problems related to optical waveguides.			x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to optical waveguides.			x	x	x	x	x	x	x
Course ILOs	**Professional Skill**								
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical waveguide design.			x	x	x	x	x	x	x
Course ILOs	**General Skills**								
d3-1-1 Identify needs for new knowledge in the field of optical waveguides types and technology.						x	x	x	x

d4-1-1 Demonstrate ability to critically evaluate other people's performance in a systematic and standard way.						x	x	x	x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical waveguides types and technology.						x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge &understanding	a1-2-1	x			x	x								
	a1-2-2	x			x	x								
	a1-2-3	x			x	x								
	a1-2-4	x			x	x								
	a1-2-5	x			x	x								
	a3-1-1	x			x	x								
Intellectual Skills	b1-1-1		x			x								
	b3-1-1		x			x								
Professional Skills	c1-1-1		x			x								
General Siklls	d3-1-1		x						x	x				
	d4-1-1		x						x	x				
	d5-1-1		x						x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Safa O. Kasap "Optical waveguides and Devices", McGraw-Hill, Second Edition, 2005.

13- Program Coordination Committee:

.Course Coordinator	Program Coordinator
Dr. Mohamed Farouk Abdelkader	**Assist. Prof. Dr. Saly Hassaneen**

Head of the Department

Prof. Dr. Rawya Yehia Rizk

Electrical Engineering Dept. Faculty of Engineering-Port Said.

Update Date: 10/2020.

ECE 617
Optics Engineering
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Optics Engineering	**Code Symbol: ECE 617**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in optics engineering theories and principles. Students will gain an understanding of diffraction theory, principles and integral, Gaussian beam propagation, lens and laser characteristics, fiber optic properties and geometrical optic. Ultimately, the tools acquired in this course will prepare students for more advanced optical engineering topics.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to lens properties, laser characteristics, fiber optic capabilities and other aspects of optical communication and technology.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to optics engineering field.
3. Develop models and methods and use techniques, principles and laws of engineering science to incorporate various optics elements into the design of optical systems for research and innovation.
4. Identify techniques which enables three-dimensional images to be made.
5. Review the tools required to prepare students for more advanced optical engineering topics.

3- Intended Learning Outcomes (ILOs) for the whole program

This course is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basics of diffraction theory, principles and integral. a1-2-2 Describe the behavior of the field of a Gaussian beam as it propagates. a1-2-3 Demonstrate sufficient essential knowledge and a deep understanding of the basics of waves optics of thin lenses. a1-2-4 Describe the behavior of the propagation of light in optical systems using Fourier transform techniques. a1-2-5 Describe Holography technique which enables three-dimensional images to be made. a1-2-6 Demonstrate sufficient essential knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to fiber optic.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 apply relevant scientific and engineering principles to solve real world optical engineering problems.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Assess and analyze risks of the professional practice to select the most appropriate model of an optical component to perform analysis and search for optimized solutions.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical engineering problems, using latest engineering techniques, skills, and tools.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process,	c1-2-1Use a wide range of computational and technical toolsincludingpertaining software packages to develop models to incorporate various optics elements into the design of optical systems for research and

component, or system related to his/her research topic in electronics and communications field.	innovation.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Diffraction Theory, Principles and Integral.	12	12	--
2- Gaussian Beam Propagation.	12	12	--
3- Wave Optics of Thin Lenses.	15	15	--
4- Fourier Optics.	15	15	--
5- Holography.	12	12	--
6- Optical Fiber: Step and Graded Index.	18	18	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-2	B1-1, B5-1	C1-1, C1-2	D5-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1^{st}	1- Diffraction Theory, Principles and Integral.	**1-4**
2^{nd}	2- Gaussian Beam Propagation.	**5-8**
3^{rd}	3- Wave Optics of Thin Lenses.	**9-13**
4^{th}	4- Fourier Optics.	**14-18**
5^{th}	5- Holography.	**19-22**
6^{th}	6- Optical Fiber: Step and Graded Index.	**23-28**

8- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Demonstrate sufficient essential knowledge and a deep understanding of the basics of diffraction theory, principles and integral.	x						
a1-2-2 Describe the behavior of the field of a Gaussian beam as it propagates.		x					
a1-2-3 Demonstrate sufficient essential knowledge and a deep understanding of the basics of waves optics of thin lenses.			x				
a1-2-4 Describe the behavior of the propagation of light in optical systems using Fourier transform techniques.				x			
a1-2-5 Describe Holography technique which enables three-dimensional images to be made.					x		
a1-2-6 Demonstrate sufficient essential knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to fiber optic.						x	
Course ILOs	**Intellectual Skills**						
b1-1-1 apply relevant scientific and engineering principles to solve real world optical engineering problems	x	x	x	x	x	x	
b5-1-1 Assess and analyze risks of the professional practice to select the most appropriate model of an optical component to perform analysis and search for optimized solutions.	x	x	x	x	x	x	
Course ILOs	**Professional Skill**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to optical engineering problems, using latest engineering techniques, skills, and tools.	x	x	x	x	x	x	
c1-2-1Use a wide range of computational and technical toolsincludingpertaining software packages to develop models to incorporate various optics elements into the design of optical systems for research and innovation.	x	x	x	x	x	x	
Course ILOs	**General Skills**						
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about optical Electronics and Communications systems types and technology.						x	

9- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
Intellectual Skills	b1-1-1			x		x								
	b5-1-1			x		x								
Professional Skills	c1-1-1			x		x								
	c1-2-1			x		x							x	
General Skills	d5-1-1		x						x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course and Lab Notes:

No lectures and Labs notes.

Essential Books (Text Books):

- Optics, 4th edition, by Eugene Hecht, (Addison Wesley Longman, 2002)

Recommended Books:

- Modern Optical Engineering, 3th ed., Warren J. Smith, Mc Graw Hill, 2000)

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Sherif M. Sharroush**
Program coordinator:	**Assist. prof. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 618

Optical Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Optical Communication Systems	**Code Symbol: ECE618**	
Lecture	**3 hours**	
Tutorial / Laboratory	**0 hours**	
Total	**3 hours**	**Bylaw 2004**

B- Professional Information

1- Course Aims:

The aims of this course are to provide the students with a solid background on the problems encountered in optical fiber communications such as attenuation and dispersion. Also, the transmitter, receiver systems, splices, connectors, and fiber-optic networks will be considered.

2- Course Objectives:

1. Discus the basic necessary background in waveguides and transmission of light in optical fiber.
2. Review the optical amplification methods.
3. Compare methods of optical fiber components and multiplexing and demultiplexing.
4. Report on optical-fiber network components.

3- Intended Learning Outcomes (ILOs):

Field	Program ILOs that the course contribute in achieving	Course ILOs
Knowledge & Understanding	A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	**a-1-2-1 Review the basic physics of light necessary for understanding optical-fiber communications.** **a1-2-2 Describe the propagation of plane waves inside the optical fiber.** **a1-2-3 Studying the principles of design of Optical amplification – multiplexing and demultiplexing.** **a1-2-4 Describe Fabrication, cabling, and installation – testing of an optical communication system** **a1-2-5 Explain Splices and connectors – light sources and transmitters – receivers.** **a1-2-6 Describe the fiber optic networks**

		and its components. **a1-2-7 Studying the impact of optical communications on the realm of communications and the internet.**
Intellectual skills	B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	**b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toOptical Communication Systems**
	B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	**b2-1-1 Solve specialized problems with available givens and parameters in optical components, optical amplifiers, multiplexing, and demultiplexing.**
Professional skills	C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	**c1-1-1Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solveproblems pertaining toOptical Communication Systems**
	C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	**c2-1-1 Professionally write reports about the evaluation of the performance of the current optical communication systems.**
	C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	**c3-1-1 Evaluate methods and tools reported in a specified published articles and researches concerningoptical amplifiers, multiplexing, and demultiplexing.**
General skills	D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	**d5-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in Optical Communication Systems.**

4-Course Contents

Week No.	Topic	Total Hours	Contact hrs		
			Lec.	Tut.	Lab.
Week 1+2+3+4	**Lecture:** Introduction to telecommunications and fiber optics - Physics of light (waveguide and quantum theories).	12	12	-	

Week 5+6+7	**Lecture:** Attenuation and dispersion.	9	9		
Week 8+9+10	**Lecture:** Optical amplification – multiplexing and demultiplexing.	9	9		
Week 11+12+13	**Lecture:** Fabrication, cabling, and installation – testing	9	9		
Week 14+15+16+17+18	**Lecture:** Splices and connectors – light sources and transmitters – receivers.	15	15		
Week 19+20+21+22+23+24	**Lecture:** Introduction to fiber optic networks and its components.	18	18		
Week 25+26+27	**Lecture:** Impact of optical communications on the realm of communications and the internet.	9	9		
Week28	General Revision.	3	3		

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contributes in achieving.	**A1-2**	**B1-1, B2-1**	**C1-1, C2-1, C3-1**	**D5-1**

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30**	**70%**	**-**	**-**		**100%**

7- Course Topics.

Topic No.	**Topic**	**Weeks**
1st	Introduction to telecommunications and fiber optics.	1-4
2nd	Attenuation and dispersion.	5-7
3th	Optical amplification – multiplexing and demultiplexing.	8-9

4th	Fabrication, cabling, and installation – testing	11-13
5th	Splices and connectors – light sources and transmitters – receivers.	14-18
6th	Introduction to fiber optic networks and its components.	19 - 24
7th	Impact of optical communications on the realm of communications and the internet with revision	25- 28

8- ILOs Matrix Topics

Course Intended Learning Outcomes (ILOs)		Course topics						
		1st	2nd	3rd	4th	5th	6th	7th
Knowledge & Understanding	**a-1-2-1 Review the basic physics of light necessary for understanding optical-fiber communications.**	X						
	a1-2-2 Describe the propagation of plane waves inside the optical fiber.		X					
	a1-2-3 Studying the principles of design of Optical amplification – multiplexing and demultiplexing.			X				
	a1-2-4 Describe Fabrication, cabling, and installation – testing of an optical communication system				X			
	a1-2-5 Explain Splices and connectors – light sources and transmitters – receivers.					X		
	a1-2-6 Describe the fiber optic networks and its components.						X	
	a1-2-7 Studying the impact of optical communications on the realm of communications and the internet.							X
Intellectual Skills	**b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining toOptical Communication Systems**		X	X	X	X	X	X
	b2-1-1 Solve specialized problems with available givens and parameters in optical components, optical amplifiers, multiplexing, and demultiplexing.			X			X	
Professional Skill	**c1-1-1Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solveproblems pertaining toOptical Communication Systems**	X	X	X	X	X	X	X
	c2-1-1 Professionally write reports about the evaluation of the performance of the current optical communication systems.					X	X	X
	c3-1-1 Evaluate methods and tools reported in a specified published articles and researches concerningoptical amplifiers, multiplexing, and			X			X	

	demultiplexing.							
General Skills	**d2-1-1Use information technology to search for the state-of-of-the-art technologies and enhancements in Optical Communication Systems.**			x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a1-2-6	x				x								
	a1-2-7	x				x								
Intellectual Skills	b1-1-1					x							x	
	b2-1-1					x							x	
Professional Skills	c1-1-1					x			x	x				
	c2-1-1		x						x	x				
	c3-1-1							x					x	
General Skills	d5-1-1								x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of laboratory reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. D. K. Mynbaev and L. L. Scheiner, Fiber-Optic Communications Technology, Prentice Hall, 2001.

2. J. M. Senior, Optical Fiber Communications: Principles and Practice, Prentice-Hall, Third Edition, 2009.

13- Program Coordination Committee:

.Course Coordinator	Program Coordinator
Dr. Saly S. Hassaneen	**Assist. prof. Dr. Saly Hassaneen**

Head of the Department

Prof. Dr. Rawya Yehia Rizk

Electrical Engineering Dept. Faculty of Engineering-Port Said.

Updated Date: 10/2020.

ECE-619

Microwave Theory and Technique

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Microwave Theory and Technique	**Code Symbol: ECE619**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in microwave engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in microwave theory and techniques and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of microwave engineering. The course is meant to create the deep understanding of the physics behind the phenomena of guided wave propagation in different microwave structures. The course is meant also to enhance the ability of the student to integrate the proper microwave component in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to microwave engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to microwave circuits and systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using microwave components.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to microwave systems.
5. Identify current problems and find solutions for it using microwave components in the area of communication systems.
6. Compare the methodologies of scientific research and the use of its different tools in the area of microwave engineering.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of microwave engineering.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the microwave propagation in guiding structures. a1-2-2 Recognize the methods of analysis for microwaves. a1-2-3 Recognize the differences between microwave circuits components and other components operating at lower frequencies.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of microwave applications.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the potential applications of new types of microwave devices in advanced electronics and communication systems.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain quality assurance concepts of different microwave components and systems development phases
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the microwave problems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwaves.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for microwave component development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to microwave problems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on vector network analyzer.

D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave components and technology.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about microwave techniques.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	Tut.	Lab.
1. Revision on the undergraduate materials related to microwaves	9	9	-	--
2. Microwave network analysis	9	9	-	--
3. Passive microwave components	9	9	-	--
4. Micrpstrip components	9	9	-	--
5. Dielectric waveguides and resonators	9	9	-	--
6. Excitation of waveguides and resonators	9	9	-	--
7. Impedance transformation and matching	9	9	-	--
8. Ferrimagnetic components	9	9	-	--
9. Microwave filters	12	12	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2 A2-1, A3-1,A5-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1,D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to microwaves	1-3
2nd	Microwave network analysis	4-6
3rd	Passive microwave components	7-9
4th	Microstrip components	10-12
5th	Dielectric waveguides and resonators	13-15
6th	Excitation of waveguides and resonators	16-18
7th	Impedance transformation and matching	19-21
8th	Ferromagnetic components	22-24
9th	Microwave filters	25-28

8- ILOs Matrix Topics

Course topics	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**
Course ILOs	**Knowledge & Understanding**								
a1-2-1 Describe the microwave propagation in guiding structures.	x		x		x			x	
a1-2-2 Recognize the methods of analysis for microwaves.	x	x	x	x	x	x		x	
a1-2-3 Recognize the differences between microwave circuits components and other components operating at lower frequencies.	x	x	x	x	x		x		x
a2-1-1 Report and discuss social effects of microwave applications.	x	x							
a3-1-1 Classify the Potential applications of new types of microwave devices in advanced electronics and communication systems.			x	x	x			x	x
a5-1-1 Explain Quality Assurance concepts of different microwave components and systems development phases.		x					x		x
Course ILOs	**Intellectual Skills**								
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the microwave problems.	x	x				x			x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwaves.		x				x	x		x
b5-1-1 Evaluate pros and cons of given methodologies for microwave component development.			x	x	x		x	x	x
Course ILOs	**Professional Skill**								
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to microwave problems, using latest engineering						x	x		x

techniques, skills, and tools.									
c2-1-1 Write and evaluate a professional report on vector network analyzer.		x							
Course ILOs	**General Skills**								
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave components and technology.		x	x	x	x			x	x
d8-1-1 Exhibit the ability to learn more about microwave techniques.		x	x	x	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer**	**Practical**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a2-1-1	x				x								
	a3-1-1	x				x								
	a5-1-1	x				x								
Intellectual Skills	b1-1-1					x								
	b3-1-1			x		x								
	b5-1-1		x	x					x					
Professional Skills	c1-1-1					x								
	c2-1-1		x	x					x	x				
	d5-1-1		x						x	x				
	d8-1-1		x						x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. David M. Pozar, " Microwave Engineering," John Wiley & Sons, 2005.

2. R. E. Collin, " Foundations for Microwave Engineering," John Wiley & Sons, 2001.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Heba Yousef**
Program coordinator:	**Assist. prof. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE-620

Microwave Communication Systems

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Microwave Communication Systems	**Code Symbol: ECE620**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in microwave engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in microwave theory and techniques and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of microwave engineering. The course is meant to create the deep understanding of the physics behind the phenomena of guided wave propagation in different microwave structures. The course is meant also to enhance the ability of the student to integrate the proper microwave component in various communication systems. Emphasis will be on the new devices and advanced methods of analysis and design.

2- Course objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to microwave engineering.
2. Collect advanced skills in the definition, physics, analysis, and solving of problems related to microwave circuits and systems.
3. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using microwave components.
4. Classify modern methods to identify/solve complex and open ended engineering problems related to microwave systems.
5. Identify current problems and find solutions for it using microwave components in the area of communication systems.
6. Compare the methodologies of scientific research and the use of its different tools in the area of microwave engineering.
7. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of microwave engineering.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Describe the microwave propagation effects. a1-2-2 Recognize the methods of analysis for microwave propagation. a1-2-3 Recognize the differences between microwave communication techniques.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and discuss social effects of microwave communication systems.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to microwave devices in communication systems.
A5-1 Explain quality assurance concepts of different electronics and communication components and systems development phases.	a5-1-1 Explain Quality Assurance concepts of different microwave communication systems development phases
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the problems of microwave communication systems.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwave communication systems.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given methodologies for microwave communication systems development.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to the problems arising in microwave communication systems, using latest engineering techniques, skills, and tools.
C2-1 Write and evaluate a professional technical report pertaining to electronics	c2-1-1 Write and evaluate a professional report on diversity techniques.

and communications technical matters.	
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave communication systems.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about microwave communication systems.

4- Course Contents

Topic	Total Hours	Contact hrs		
		Lec.	**Tut.**	**Lab.**
1. Revision on the undergraduate materials related to microwave propagation	12	12	-	--
2. Review on propagation effects including reflection, refraction, multipath, scattering and absorption	12	12	-	--
3. Classification of microwave communication systems	12	12	-	--
4. Analysis and design terrestrial radio links	12	12	-	--
5. Analysis and design satellite radio links	12	12	-	--
6. Effect of noise, interference and fading	12	12	-	--
7. Diversity techniques	12	12	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contribute in achieving	A1-2, A2-1, A3-1,A5-1	B1-1, B3-1, B5-1	C1-1, C2-1	D5-1,D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Discretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Revision on the undergraduate materials related to microwave propagation	1-4
2nd	Review on propagation effects including reflection, refraction, multipath, scattering and absorption	5-8
3rd	Classification of microwave communication systems	9-12
4th	Analysis and design terrestrial radio links	13-16
5th	Analysis and design satellite radio links	17-20
6th	Effect of noise, interference and fading	21-24
7th	Diversity techniques	25-28

8- ILOs Matrix Topics

Course topics	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}	7^{th}
Course ILOs	**Knowledge & Understanding**						
a1-2-1 Describe the microwave propagation effects.	x	x					
a1-2-2 Recognize the methods of analysis for microwave propagation.	x	x	x	x			
a1-2-3 Recognize the differences between microwave communication techniques.			x	x	x		x
a2-1-1 Report and discuss social effects of microwave communication systems.	x	x	x	x			
a3-1-1 Classify the Potential applications of new types of microwave devices in communication systems.			x	x			
a5-1-1 Explain Quality Assurance concepts of different microwave communication systems development phases.				x	x	x	x
Course ILOs	**Intellectual skills**						
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the problems of microwave communication systems.	x	x		x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems related to microwave communication systems.		x		x	x	x	x
b5-1-1 Evaluate pros and cons of given methodologies for microwave communication systems development.			x	x	x		x
Course ILOs	**Professional and practical skills**						
c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating engineering solutions related to the problems arising in microwave		x		x	x	x	x

communication systems, using latest engineering techniques, skills, and tools.							
c2-1-1 Write and evaluate a professional report on diversity techniques.							x
Course ILOs	**General and transferrable skills**						
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about microwave communication systems.			x	x	x	x	x
d8-1-1 Exhibit the ability to learn more about microwave communication systems.		x	x	x	x	x	x

9- <u>Teaching and Learning Method:</u>

Course Intended learning outcomes (ILOs)		**Teaching and Learning Method**												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Report**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Practical Experiments**
Knowledge & understanding	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a2-1-1		x	x					x	x				
	a3-1-1		x	x					x	x				
	a5-1-1		x							x				
Intellectual Skills	b1-1-1		x											
	b3-1-1		x											
	b5-1-1		x	x					x	x				
Professional Skills	c1-1-1		x											
	c2-1-1		x	x					x	x				
	d5-1-1		x							x				
	d8-1-1		x							x				

10- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College

Total	100%	Council

11- Facilities required for teaching and learning

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of references:

1. Roger L. Freeman, " Radio System Design for Telecommunications ," Third Edition, John Wiley & Sons, 2007.

2. Louis J. Ippolito, Jr., "Satellite Communications Systems Engineering Atmospheric Effects, Satellite Link Design and System Performance," John Wiley & Sons, 2008.

13- Program Coordination Committee:

Course Coordinator:	**Dr. Rania M. Abd Allah**
Program coordinator:	**Assist. prof. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 621
Random System Analysis
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering)**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Random System Analysis	**Code Symbol: ECE621**	
Lecture	**3 hours**	
Tutorial / Laboratory	**--**	
Total	**3 hours**	**By law 2000**

B- Professional Information

1- Course Aims:

This course is designed to extend basic concepts learned in systems engineering. For those students who look toward an industrial position after graduation, this course is designed to widen background in system analysis and help them to meet the industry demand. This course will also provide an excellent opportunity to prepare the graduates for advanced study in different areas of random system analysis. The course is meant to create the deep understanding of the basics and theories behind the modern random system analysis. Emphasis will be on the new methods of analysis and design.

2- Course Aims:

The main Objectives of this course are to:

1. Gain knowledge and understanding of key and advanced facts, theories, concepts, principles and techniques relevant to random system analysis.
2. Develop models and methods and use techniques, principles and laws of engineering science in order to lead to engineering applications using random system analysis.
3. Classify modern methods to identify/solve complex and open ended engineering problems related to random systems.
4. Identify current problems and find solutions for it using random system analysis.
5. Apply specialized knowledge and combine it with relevant knowledge in his / her professional practice in the area of random systems.

3- Intended Learning Outcomes (ILOs)

Program ILOs	Course ILOs
A. Knowledge and understanding	

A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge, concepts and theories of mathematics to understandprobabilities and stochastic processes a1-1-2 Demonstrate sufficient essential knowledge, concepts and theories of mathematics todevelop mathematical models for random signals.
A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Illustrate the response of linear systems to random inputs. a1-2-2 Describe Kalman filter. a1-2-3 Demonstrate additional knowledge on kalman filters and their applications. a1-2-4 Recognize the methods of analysis for random systems. a1-2-5 Describe the main differences between determined and random systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the random systems problems.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Analyze, interpret and manipulate data with a non-classical nature and relate it to solve professional problems related to random systems.
Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems related to Random System Analysis
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis and design professional random systems problems.
D. General and transferrable skills	
D2-1 Demonstrate efficient IT	d2-1-1 Use state-of-the-art computer aided design

capabilities in such a way that serves in the development of him/ her professional practice and research.	tools for solving professional random systems problems.

4- Course Contents

Topic	*Total Hours*	*Contact hrs*		
		Lec.	**Tut.**	**Lab.**
1. Probabilities and stochastic processes	12	12	-	--
2. Mathematical models for random signals.	12	12	-	--
3. Response of linear systems to random inputs.	12	12	-	--
4. Kalman filter.	12	12	-	--
5. Applications and additional topics on kalman filters.	9	9	-	--
6. Smoothing and applications.	12	12	-	--
7. Integrated problems.	15	15	-	--
Total	84	84	-	--

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	**Intellectual Skills**	**Professional Skills**	**General Skills**
Program Academic Standards that the course contribute in achieving	**A1-1, A1-2**	**B1-1, B2-1**	**C1-1, C1-2**	**D2-1**

Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**			**100%**

6- Course Topics.

Topic No.	Topic	Weeks
1st	Probabilities and stochastic processes	1-4
2nd	Mathematical models for random signals.	5-8

3rd	Response of linear systems to random inputs.	9-12
4th	Kalman filter.	13-16
5th	Applications and additional topics on kalman filters.	17-19
6th	Smoothing and applications.	20-23
7th	Integrated problems.	24-28

7- ILOs Matrix Topics

Course topics	1st	2nd	3rd	4th	5th	6th	7th
Course ILOs	Knowledge & Understanding						
a1-1-1 Demonstrate sufficient essential knowledge, concepts and theories of mathematics to understand probabilities and stochastic processes	x						
a1-1-2 Demonstrate sufficient essential knowledge, concepts and theories of mathematics to develop mathematical models for random signals.		x					
a1-2-1 Illustrate the response of linear systems to random inputs.			x				
a1-2-2 Describe Kalman filter.				x			
a1-2-3 Demonstrate additional knowledge on kalman filters and their applications.					x		
a1-2-4 Recognize the methods of analysis for random systems.					x	x	
a1-2-5 Describe the main differences between determined and random systems.					x		x
b1-1-1 Demonstrate an investigatory and analytic thinking approach (Problem solving) to solve the random systems problems.	x	x	x	x	x	x	x
b2-1-1 Analyze, interpret and manipulate data with a non-classical nature and relate it to solve professional problems related to random systems.						x	x
c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems related to Random System Analysis	x	x	x	x	x	x	x
c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis and design professional random systems problems.	x	x	x	x	x	x	x
d2-1-1 Use state-of-the-art computer aided design tools for solving professional random systems problems.	x	x	x	x	x	x	x

8- Teaching and Learning Method:

Course Intended learning	Teaching and Learning Method

outcomes (ILOs)		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x				x								
	a1-1-2	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
Intellectual Skills	b1-1-1					x								
	b2-1-1					x							x	
Professional and practical skills	c1-1-1					x								
	c2-1-1			x		x							x	
General Skills	d2-1-1			x					x				x	

9- <u>Assessment</u>

10.1 Assessment Methods

Final Written Examination	:	to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	**100**	Decided by the College Council
Total	**100%**	

10- <u>Facilities required for teaching and learning</u>

Internet for online sessions- Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using random systems simulators on general computer labs during the class or/and home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- <u>List of references:</u>

1. S.L.Miller, " Probability and random processes with applications to signal processing and communications," Academic Press, **2nd edition, 2012.**

2. D.F.Mix,''Random Signal Analysis.'' **Prentice Hall, 1995.**

12- Program Coordination Committee:

Course Coordinator:	**Dr. Mohamed Farouk Abdelkader**
Program coordinator:	**Assist. prof. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

ECE 622

Theory of Electronic Navigation

Course

Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Theory of Electronic Navigation	**Code Symbol: ECE 622**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims at providing students with the basic knowledge and understanding of theories of navigation systems. This includes Mathematical and statistical methods of basic navigation systems, error analysis, and error ellipse.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of principles of navigation systems.
2. Compare error analysis methods.
3. Build advanced skills in assessing navigation systems performance.
4. Determine error ellipses for navigation systems.
5. Apply the methodologies of scientific research and the use of its different tools in the area of navigation systems.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of statistical methods required in analysis of navigation systems. a1-1-2Demonstrate sufficient essential knowledge concepts and theories of mathematics required in modeling of navigation systems.

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Discuss error analysis anderror ellipse a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofhow different navigation systems work and perform.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining torelated to navigation.
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems related toerror analysis anderror ellipse.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Evaluate pros and cons of given methodologies for a navigation system.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problemsrelated to navigation.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis and design a navigation system.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on Mathematical Models of Navigation Systems.
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about navigation systems.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Principles of Radio Navigation	18	18	--
2- Error Analysis	18	18	--
3- Error Ellipse	12	12	--
4- Principles of Navigation Systems	18	18	--
5- Mathematical Models of Navigation Systems	18	18	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1-1, A1-2**	**B1-1, B2-1, B3-1**	**C1-1, C1-2, C2-1**	**D5-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	30%	70%	-	-		100%

7- Course Topics.

Topic No.	Topic	Weeks
1st	1- Principles of Radio Navigation	**1-6**
2nd	2- Error Analysis	**7-12**
3rd	3- Error Ellipse	**13-15**
4th	4- Principles of Navigation Systems	**16-21**
5th	5- Mathematical Models of Navigation Systems	**22-28**

8- ILOs Matrix Topics

Course topics	Course topics				
	1st	2nd	3rd	4th	5th
a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of statistical methods required in analysis of navigation systems.		x	x		x
a1-1-2Demonstrate sufficient essential knowledge concepts and theories of mathematics required in modeling of navigation systems.					x
a1-2-1 Discuss error analysis anderror ellipse		x	x		
a1-2-2 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories ofhow different navigation systems work and perform.	x				x
b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining torelated to navigation.		x	x	x	x
b2-1-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems related toerror analysis anderror ellipse.		x	x		
b3-1-1 Evaluate pros and cons of given methodologies for a navigation system.	x				x
c1-1-1 Express competence skills, such as identifying, formulating, analyzing navigation errors and performances.		x	x	x	x
c1-2-1 Use a wide range of computational and technical tools and techniques, includingpertaining software packages to analysis and design a navigation system.		x	x		x
c2-1-1 Write and evaluate a professional report on error ellipse methods.		x	x		
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about navigation systems.	x	x	x	x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x				x								
	a1-1-2	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								

Intellectual Skills	b1-1-1					x								
	b2-1-1			x		x							x	
	b3-1-1			x		x							x	
Professional Skills	c1-1-1			x		x								
	c1-2-1												x	
	c2-1-1		x	x					x	x				
	d5-1-1		x	x					x	x				

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

10- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and/or at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

11- List of References:

Course and Lab Notes:

Lectures notes are provided

Essential Books (Text Books):

Electronic Navigation Systems, Laurie Tetley and David Calcutt, 3rd edition, 2001, ISBN: 0 7506 51385

12- Program Coordination Committee:

Course Coordinator: **Associate Prof. Dr. Sherif Abo-El-Enein**

Program coordinator: **Assist. prof. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

ECE 623
Electronic Navigation Systems
Course
Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Electronic Navigation Systems	**Code Symbol: ECE 623**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims at providing students with advanced knowledge and understanding of electronic navigation system including direction finders, position fixing systems, inertial navigation systems, echo sounders, LORAN systems, and integrated navigation systems.

2- Course Objectives:

The main Objectives of this course are to:

1. Gain knowledge and understanding of electronic navigation systems.
2. Assess the performance of different systems used in navigation.
3. Identify different technologies utilized in electronic navigation.
4. Compare the methodologies of scientific research and the use of its different tools in the area of electronic navigation.
5. Review electronic navigation.

3- Intended Learning Outcomes (ILOs) for the whole program

Electronics and Communication Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer scienceappropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics to deal effectively with analyzing and designing navigation systems.

A1-2Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of the courses pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of signals and systems. a1-2-2 Demonstrate sufficientspecialized knowledge and a deep understanding of Radio and Inertial navigation systems. a1-2-3 Recognize direction finders and position fixing systems a1-2-4 Discuss Echo sounders and LORAN. a1-2-5 Demonstrate sufficient specialized knowledgeto be able to identifying, formulating, solving, analyzing, and designing problems pertaining Integrated Navigation Systems.
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1 Report and recognize the professional aspects of navigation systems and their effects on the environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronic navigation systems.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate an investigatory and analytic thinking approach to solve problems related to electronic navigation systems.
B3-1Demonstrate a high level of competence in the coordination of different sources of knowledge to solve professional problems.	b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems in electronic navigation.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Evaluate pros and cons of given electronic navigation system.
C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern, and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, and analyzing various navigation systems.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write and evaluate a professional report on integrated navigation systems.
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified	c3-1-1 Research and evaluate latest methods and tools reportedin analyzing and designing satellite navigational systems.

problem related to his/her research topic in electronics and communications field.	
D. General and transferrable skills	
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic navigation systems.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about satellite navigation systems.

4- Course Contents

Lecture Topic	Total Hours	Lecture Hours	Practical /Tutorial Hours
1- Signals and Systems	3	3	--
2- Radio Navigation Systems	9	9	--
3- Direction Finders	12	12	--
4- Position Fixing Systems	12	12	--
5- Inertial Navigation Systems	12	12	--
6- Echo Sounders	12	12	--
7- LORAN	12	12	--
8- Integrated Navigation Systems	12	12	--
Total	84	84	--

5- Relationship between the course and the program

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	**A1-1, A1-2, A2-1, A3-1**	**B1-1, B3-1, B5-1**	**C1-1, C2-1, C3-1**	**D5-1 D8-1**

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
---	**---**	**30%**	**70%**	**-**	**-**		**100%**

7- Course Topics.

Topic No.	Topic	Weeks
1st	Signals and Systems	**1**
2nd	Radio Navigation Systems	**2-4**
3rd	Direction Finders	**5-8**
4th	Position Fixing Systems	**9-12**
5th	Inertial Navigation Systems	**13-16**
6th	Echo Sounders	**17-20**
7th	LORAN	**12-24**
8th	Integrated Navigation Systems	**25-28**

8- ILOs Matrix Topics

Course ILOs	**Course topics**							
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
a1-1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics to deal effectively with analyzing and designing navigation systems.	x	x	x	x	x	x	x	x
a1-2-1 Demonstrate sufficient specialized knowledge and a deep understanding of the concepts and theories of signals and systems.	x							
a1-2-2 Demonstrate sufficientspecialized knowledge and a deep understanding of Radio and Inertial navigation systems.		x			x			
a1-2-3 Recognize direction finders and position fixing systems			x	x				
a1-2-4 Discuss Echo sounders and LORAN.						x	x	
a1-2-5 Demonstrate sufficient specialized knowledgeto be able to identifying, formulating, solving, analyzing, and designing problems pertaining Integrated Navigation Systems.								x
a2-1-1 Report and recognize the professional aspects of navigation systems and their effects on the environment.		x			x			x
a3-1-1 Demonstrate knowledge of contemporary, current, and advanced								x

topicsrelated to electronic navigation systems.								
b1-1-1 Demonstrate an investigatory and analytic thinking approach to solve problems related to electronic navigation systems.		x	x	x	x	x	x	x
b3-1-1 Analyze, interpret and manipulate data from a variety of sources and relate it to solve professional problems in electronic navigation.		x	x	x	x	x	x	x
b5-1-1 Evaluate pros and cons of given electronic navigation system.		x			x			x
c1-1-1 Express competence skills, such as identifying, formulating, and analyzing various navigation systems.		x	x	x	x	x	x	x
c2-1-1 Write and evaluate a professional report on integrated navigation systems.								x
c3-1-1 Research and evaluate latest methods and tools reportedin analyzing and designing satellite navigational systems.		x			x			x
d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about electronic navigation systems.					x			x
d8-1-1 Exhibit the ability to learn more about satellite navigation systems.					x			x

Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Report	Self learning	Cooperative	Discovering	Computer Simulation	Practical Experiments
Knowledge & understanding	a1-1-1	x				x								
	a1-2-1	x				x								
	a1-2-2	x				x								
	a1-2-3	x				x								
	a1-2-4	x				x								
	a1-2-5	x				x								
	a2-1-1	x				x								
	a3-1-1	x				x								
Intellectual Skills	b1-1-1			x		x								
	b3-1-1			x		x								
	b5-1-1			x		x			x					

Professional Skills	c1-1-1			x		x			x					
	c2-1-1		x	x					x	x				
	c3-1-1		x	x					x	x				
General Skills	d5-1-1			x					x	x				
	d8-1-1								x	x				

9- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions -Blackboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage (During Lectures):

Students should be encouraged to use library technical resources in the preparation of reports and presentation.

12- List of References:

Course and Lab Notes:

Lectures notes.

Essential Books (Text Books):

Electronic Navigation Systems, Laurie Tetley and David Calcutt, 3rd edition, 2001, ISBN: 0 7506 51385

12- <u>Program Coordination Committee:</u>

Course Coordinator: **Dr. Islam E. Shaalan**

Program coordinator: **Assist. prof. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

Master of Science

Thesis

Specification

Thesis Specification

Program on which the thesis is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc (At least 2 years & Not more than 5 years)**
Date of specification approval	**2020**

A- Basic Information

Title: Thesis	**Code Symbol: Without**	
Lecture	**Independent but regular contacts with the supervisor is required**	
Tutorial / Laboratory	**Independent**	
Total	**At least 2 years & Not more than 5 years**	**Bylaw 2000**

B- Professional Information

1- Thesis Aims:

The Master's Thesis is an independent project (degree project) to develop and display the skills and abilities of the student to carry out individual, independent scientific work on a specific topic, exploring it in a trans-disciplinary manner, and assessing solutions and conclusions with respect to the different dimensions of sustainability. It does not aim to provide additional substantive material or methodological toolkit, the way typical graduate courses do. Its goal is rather modest as it attempts to apply student cumulative understanding and skills to specific research situation. From the perspective of one's program of study, however, the thesis phase poses a real-world test helping to make a realistic transition from coursework to dissertation. Completing a dissertation successfully is the last and often most challenging part of master studies. The goal is to put one's theoretical knowledge and research proficiency to practical test by carrying out an independent, albeit guided, project producing an original piece of research and making a significant contribution to solving a problem and expanding the knowledge base in the specific discipline. While research is an ongoing process, in which one is expected to stay on top of the relevant developments in the discipline, the assumption is that students are capable of thinking through the important milestones in the dissertation process and developing a dissertation prospectus that spells out the core concepts and questions as well as the designs of research and the structure of intended dissertation. The overall aim of the thesis phase is that the students should further develop and enhance their ability to independently plan, conduct and report on a research project which makes a contribution to the current state-of-the-art in the area. Also, the student should exhibit ability to in detail, creatively, with a high level of clarity and authority, using scientific scrutiny and adequate tools identify, explain, analyze and assess issues pertinent to a M. Sc thesis in the research field, within which the thesis project is placed.

2- Thesis Objectives:

On balance, a successful completion of the thesis phase is marked by student ability to:

1. Apply his/her theoretical and methodological understanding and skills into devising researchable ideas and specific research questions and hypotheses,
2. Conduct a focused review of the relevant literature and create appropriate conceptual framework,
3. Develop a realistic research design with specific research strategies,
4. Communicate research ideas and their appropriate theoretical and methodological issues effectively and efficiently,
5. Gain understanding of the process of dissertation including stress, time, and project management, committee formation, dissertation proposition and defense, and human subjects reviews.
6. Develop and execute his/her survey to collect the necessary data to prove / support the problem that he has set up.
7. Identify own knowledge needs with respect to the planned project.
8. Write theses and report on research projects in a scientifically sound way.
9. Describe what the contribution of his/her thesis is and relate it to the current state-of-the-art within one or several international knowledge communities within the discipline
10. State the threats against and argue for the validity of her/his research methods, and in doing so, show awareness of that the concept of validity may have different values and be used in different ways within qualitative and quantitative research approaches.
11. Analyze a master's thesis in a constructively critical way and identify the major strong and weak points of the thesis.
12. Describe how and where he/she has searched for, and why he/she has probably found the most relevant related work.

3- Intended Learning Outcomes (ILOs) for the whole program

The thesis is designed to achieve the above objectives through the following **Intended Learning Outcomes (ILOs)**:

Program ILOs	Thesis ILOs
A. Knowledge and understanding	
A2-1 Discuss mutual influence between professional practice of electronics and communication technologiesand its impacts on the environment.	a2-1-1Report and Discuss mutual relation between professional social aspects of his/her research and its effects on the Environment.
A3-1 Demonstrate knowledge of contemporary, current, and advanced topics related to electronics and communications engineering issues.	a3-1-1 Classify the potential applications of his/her research and its value in relation to contemporary, current, and advanced research issues. a3-1-2 Describe what the contribution of his/her thesis is and relate it to the current state-of-the-art within one or several international knowledge communities within the discipline.
A4-1 Gain a depth of knowledge, understanding, and fundamentals of ethical & legal professional practice of scientific research in the field of electronics and communication engineering.	a4-1-1 Describe and explain principles for ethical considerations in relation to scientific research.
A5-1 Explain quality assurance concepts of different electronics and communication	a5-1-1 Explain quality assurance concepts of different microwave communication systems

components and systems development phases.	development phases
A6-1 Recognize basics and ethics of scientific research.	a6-1-1 Demonstrate insights into ethical aspects on research in general.
B. Intellectual skills	
B2-1 Apply broad knowledge of modern computational methods and think critically to solve unstructured problems (with limited and contradictory information) related to electronics and communications engineering.	b2-1-1 Apply his/her theoretical and methodological understanding and skills into devising researchable ideas and specific research questions and hypotheses and to formulate judgments with incomplete data.
B3-1 Use integrated approaches including the coordination of different sources of knowledge and practices to solve professional scientific problems.	b3-1-1 Integrate, critically and systematically, theoretical knowledge and empirical data, using appropriate research methods and properly handling uncertainties, thereby contributing to the production of knowledge. b3-1-2 Demonstrate an ability to integrate knowledge and handle complexity, and to formulate judgments with incomplete data.
B4-1Carry out a research study and writing a scientific methodology plain and add new information to the knowledge and write scientific paper.	b4-1-1 Demonstrate an ability to critically, independently and creatively identify and formulate a realistic research plan with specific research strategies for his applied research, specifying steps and timelines, and write scientific paper. b4-1-2 Carry out one or several research study and publish them in specialized journal or conference, describing what the contribution of his/her thesis.
B5-1 Assess and analyze risks of the professional practicein electronics and communications engineering.	b5-1-1 Analyze his/her master’s thesis in a constructively critical way and identify the major risks of the professional practice related to the thesis.
B6-1Plan to imporove progress performance in the field of electronics and communications engineering.	b6-1-1 Demonstrate an ability to identify his/her need of further knowledge and to take responsibility for developing such knowledge through a plan to guide progress in his / her professional career.. b6-1-2 Assess and argue for the relevance of the findings with regard to practical implications, and identify the need for further knowledge within the field.
B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development electronics and communications systems.	b7-1-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development his/her research plan.
C. Professional and practical skills	

C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-2-1Use a wide range of computational and technical tools, techniques, including pertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters.	c2-1-1 Write thesis and report on research projects in a scientifically sound way. c2-1-2 Conduct a focused review of the relevant literature and create appropriate conceptual framework,
C3-1 Evaluate methods and tools reported in specified published articles and researches concerning specified problem related to his/her research topic in electronics and communications field.	c3-1-1 Analyze and evaluate methods and tools reported in a specified published articles and researches concerning specified problem related to electronics and communications field in a constructively critical way and identify the major strong and weak points of them.

D. General and transferrable skills	
D1-1 Express professional and communication skills effectively in different aspects.	d1-1-1 Communicate research ideas and their appropriate theoretical and methodological issues effectively and efficiently.
D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer aided design tools for solving electronics and communications engineering problems.
D3-1 Apply self-evaluation and specify his educational needs related to electronics and communications aspects.	d3-1-1 Identify needs for new knowledge in the specific field in which the MS.c thesis is to be written.
D4-1 Design standards to evaluate others performance.	d4-1-1 Demonstrate ability to critically evaluate other people's performance in a systematic and standard way.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to develop and execute his/her survey to collect the necessary data to prove / support the problem that he/she has set up.
D6-1 Collaborate effectively within multidisciplinary team and lead teams in different professional contexts.	d6-1-1 Demonstrate significantly enhanced group working abilities to implement a certain project.
D7-1Demonstrate a high level of competence in the time management.	d7-1-1 Manage time and work to deadlines.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Express a strong foundation of continuous learning so they can maintain their technical competency

4- <u>Thesis Phases:</u>

The Master's Thesis is an independent project (degree project) to develop and display the skills and abilities of the student to carry out individual, independent scientific work on a specific topic. The readings for the thesis work are selected by the individual student in collaboration with the supervisor. **The Master's Thesis phases can be outlined as follow:**

1. Developing a thesis proposal by formulating a realistic research plan with specific research strategies and specifying steps and timelines
2. Identify and construct a problem/thesis statement.
3. Presentation and defending of self-authored materials describing the thesis proposal at a seminar with external discussants (Department Staff).
4. Conduct a focused review of the relevant literature and create appropriate conceptual framework.
5. Analyze and evaluate methods and tools reported in a specified published articles and researches concerning the thesis problem in a constructively critical way and identify the major strong and weak points of them.
6. Carry out research:
    - Use state-of-the-art computer aided design tools.
    - Provide practical and/or laboratory services that can help.
7. Analysis and discussion of the simulated / practical results.
8. Developing defensible conclusions.
9. Writing the final thesis.
10. Presentation and defending of self-authored materials describing the thesis at a seminar with external discussants (Department Staff).
11. Reporting on and presenting the thesis in a final defense. At the examination seminar, the student should be able to respond to criticism given and also act as an opponent.

- The thesis work also includes a number of thesis workshop sessions in advance, where research and writing methods are discussed, and where the individual initial drafting of the thesis scope and outline is discussed.
- Throughout these phases:
    - ➢ The academic supervisor helps and guides the students.
    - ➢ The student is to write a manuscript in the format of a scientific article to be published.
    - ➢ Documentation is carried out.

5- <u>Relationship between the course and the program</u>

Field	NAQAAE Academic Reference Standards (ARS)			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A2-1, A3-1, A4-1, A5-1, A6-1	B2-1, B3-1, B4-1, B5-1, B6-1, B7-1	C1-2, C2-1, C3-1	D1-1, D2-1, D3-1, D4-1, D5-1, D6-1, D7-1, D8-1

6- <u>Course Subject Area:</u>

A	B	C	D	E	F	G	
Humanities	**Mathematics**	**Basic**	**Applied**	**Computer**	**Projects**	**Disccretionry**	**Total**

and Social Science	**and Basic Sciences**	**Engineering Science**	**Engineering And Design**	**Applications and ICT**	**and practice**	**subjects**	
---	---	-	-	-	100		100%

7- Learning and Teaching Methods:

Besides proposing, planning, conducting and presenting one's own master thesis project, the student is required to read, analyze and evaluate methods and tools reported in a specified published articles and researches concerning the thesis problem in a constructively critical way and identify the major strong and weak points of them and write an opponent report about it. The supervisor supports and supervises the student throughout the entire thesis project, but it is the student who must take on the responsibility of requesting support and supervision during the on-going project. The student is expected to report to her/his supervisor at least every four weeks. Besides this, the student is required to hand in a written progress report at least every three months. One or several lectures or seminars held by internal guest researchers, and focusing on research methods and the art of presenting research results, are arranged during the thesis development. In-seminar discussions should be enhanced with additional student-advisor (and committee, if appropriate) meetings. Students are expected to be prepared for all seminar meetings. It is mandatory for the student to have regular contacts with the supervisor so that the supervisor is able to follow the student's work process to secure the progress and the quality of the work. The thesis work also includes a number of thesis workshop sessions in advance, where research and writing methods are discussed, and where the individual initial drafting of the thesis scope and outline is discussed.

8- Assessment Methods:

7.1 Assessment is carried out by evaluating of the student ability to clearly present the thesis orally and to discuss and defend the conclusions and the knowledge and arguments behind them, in a dialogue with examiner committee.

7.2 For a passing grade the student must (a) make an acceptable oral presentation of the thesis; (b) perform an acceptable defense of the thesis and should be able to respond to criticism given by the examiner committee and also act as an opponent.

9- Facilities required for teaching and learning

Internet for online sessions- Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab – Specialized Electronic and Communication Lab - Library.

A. laboratory Usage:

Students are expected to prepare and conduct some computer simulation and practical works using computer ad specialized Electronic and Communication labs.

B. Library Usage:

Students should be encouraged to use library technical resources during the thesis development.

10- List of References:

The readings for the thesis work are selected by the individual student in collaboration with the supervisor.

11- Program Coordination Committee:

Program coordinator: **Assist. prof. Dr. Saly Hassaneen**

Head of the Department: **Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020

SCI 603

Higher Mathematics Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Physics and Mathematical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Higher Mathematic	**Code Symbol: SCI 603**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course aims to equip the student with the essential knowledge and stimulate intuitive understanding of some basic concepts and methods of Statistics.

2- Course Objectives:

By the end of the course the students will be able to:

1. Apply the basics and the methodologies of Mathematics and to use its different tools
2. Combine some applications of the Mathematical knowledge with relevant knowledge in the professional practice.
3. Recognize an appropriate range of Mathematical professional skills and the use of appropriate technology tools to serve professional application.

3- Intended Learning Outcomes (ILOs):

Program ILOs	Course ILOs
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and Communication Engineering.	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the concepts and theories of Vector analysis Calculus of variation appropriate to Electronics and Communication Engineering field. a1-1-2 Discuss the boundary and generating functions. a1-1-3 Demonstrate sufficient essential knowledge to understand how to solve of systems of linear differential equations.

	a1-1-4 Recognize Fourier integral applied to ordinary and partial differential equations. a1-1-5 Demonstrate sufficient essential knowledge to understand how to do Tensor analysis. a1-1-6 Illustrate how to solve Integral equations.
A6-1 Recognize basics and ethics of scientific research.	a6-1-1 Demonstrate insights into ethical aspects on research in general.
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, analyzing, and designing problems pertaining to a M. Sc thesis, as well as the courses that affect his/her professional research practice in Electronics and Communication Engineering.	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, and analyzing, engineering problems pertaining to professional research practice in Electronics and Communication Engineering field.
B6-1 Plan to improve progress performance in the field of electronics and communications engineering.	b6-1-1 Demonstrate an ability to identify his/her need of further knowledge and to take responsibility for developing such knowledge through a plan to guide progress in his / her professional career.
B7-1 Acquire decision making capabilities in different situation when facing problems related to analysis, design and development electronics and communications systems.	b7-1-1 Acquire decision making capabilities in different situation when facing problems related to analysis and design

4- Course Contents:

No.	*Topic*	*Total hours*	*Lec. hours*
1	Vector analysis	12	12
2	Calculus of variation	9	9
3	Boundary functions	12	12
4	Systems of Linear differential equations	9	9
5	Fourier integral applied to ordinary and partial differential equations	9	9
6	Tensor Analysis	12	12
7	Generating functions	12	12

8	Integral equations	9	9
Total		84	84

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1, A6-1	B1-1, B6-1, B7-1	---	-----

6- Course Subject Area:

A	**B**	**C**	**D**	**E**	**F**	**G**	
Humanities and Social Science	**Mathematics and Basic Sciences**	**Basic Engineering Science**	**Applied Engineering And Design**	**Computer Applications and ICT**	**Projects and practice**	**Disccretionry subjects**	**Total**
	100%						100%

7- Course Topics.

Topic No.	***Topic***	***weeks***
1	Vector analysis	1-4
2	Calculus of variation	5-7
3	Boundary functions	8-11
4	Systems of Linear differential equations	12-14
5	Fourier integral applied to ordinary and partial differential equations	15-17
6	Tensor Analysis	18-21
7	Generating functions	22-25
8	Integral equations	26-28

8- <u>ILOs Matrix Topics</u>

Course Intended Learning Outcomes (ILOs)		**Course topics**							
		1st	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Knowledge &	a1-1-1 Demonstrate sufficient	**x**	**x**						

Understanding	essential knowledge and a deep understanding of the concepts and theories of vector analysis and calculus of variation appropriate to Electronics and Communication Engineering field.								
	a1-1-2 Discuss the boundary and generating functions.			x				x	
	a1-1-3 Demonstrate sufficient essential knowledge to understand how to solve of systems of linear differential equations.				x				
	a1-1-4 Recognize Fourier integral applied to ordinary and partial differential equations.					x			
	a1-1-5 Demonstrate sufficient essential knowledge to understand how to do Tensor analysis.						x		
	a1-1-6 Illustrate how to solve Integral equations.								x
	a6-1-1 Demonstrate insights into ethical aspects on research in general.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Intellectual Skills	b1-1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifying, formulating, solving, and analyzing, engineering problems pertaining to professional research practice in Electronics and Communication Engineering field.	x	x	x	x	x	x	x	x
	b6-1-1 Demonstrate an ability to identify his/her need of further knowledge and to take responsibility for developing such knowledge through a plan to guide progress in his / her professional career.	x	x	x	x	x	x	x	x
	b7-1-1 Acquire decision making capabilities in different situation when facing	x	x	x	x	x	x	x	x

	problems related to analysis and design								

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method												
		Lecture+ online sessions	**Presentation and Movies**	**Discussion**	**Tutorial**	**Problem solving**	**Brain storming**	**Projects**	**Site visits**	**Self learning**	**Cooperative**	**Discovering**	**Computer Simulation**	**Playing**
Knowledge & understanding	a1-1-1	x				x								
	a1-1-2	x				x								
	a1-1-3	x				x								
	a1-1-4	x				x								
	a1-1-5	x				x								
	a1-1-6	x				x								
	a6-1-1	x				x								
Intellectual Skills	b1-1-1			x		x								
	b6-1-1			x		x								
	b7-1-1			x		x								

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	Week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions- Whiteboard – Class Room Equipped with Computer and Video Projector - Library.

A. Library Usage:

Students are encouraged to use library technical resources in the studying of the course.

12- List of references:

Mathematics for Engineers: A Modern Interactive Approach, Anthony Croft, Tony Croft, Robert Davison, Pearson/Prentice Hall, 2008.

13- Program Coordination Committee:

Course Coordinator:	**Prof** . Dr. Khairy Elsersy.
Program coordinator:	**Assist. prof. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Updated Date: 10/2020.

CCE 616

Advanced
Computer Languages & Programming

Course Specification

Course Specification

Program on which the course is given	**M. Sc in Electrical Engineering (Specialization: Electronics and Communications Engineering).**
Major or minor element of program	**Major**
Department offering the program	**Electrical Engineering**
Department offering the course	**Electrical Engineering**
Academic year/Level	**M. Sc Preparatory Year**
Date of specification approval	**2020**

A- Basic Information

Title: Advanced Computer Language Programming	**Code Symbol: CCE 616**	
Lecture	**3 hours**	
Tutorial / Laboratory	**-**	
Total	**3 hours**	**Bylaw 2000**

B- Professional Information

1- Course Aims:

This course provides an introduction to the field of computer Programming, simulation and covers the Basics of Matlab programming Language, problem solving, and software engineering .The course aims to acquire the Post graduate students with the essential knowledge to understand the advanced of the computer programming. The course learns the student to write programs that allow numeric, character and work with single and multi-dimensional arrays. The process of opening, writing to and reading from and closing files is covered in this course.

2- Course Objectives

1- Collect the knowledge and understanding of the advanced computer Programming.
2- Define the requirements of solving problems using Matlab Programming language..
3- Revise the Matlab toolboxes .
4- Analyze different problems using Matlab simulation

3- Intended Learning Outcomes (ILOs) for the whole program

All (Power, Computer & control and Electronics & Communication) Engineering Master Program is designed to achieve the above objectives through the following Intended **Learning Outcomes (ILOs)**:

Program ILOs	**Course ILOs**
A. Knowledge and understanding	
A1-1 Demonstrate sufficient essential knowledge and understanding of the concepts and theories of mathematics and computer science appropriate to their areas of specialization in Electronics and	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic programming . a1-1-2 Classify the basic elementary math

Communication Engineering.	built-in functions a1-4-3 Classify the useful commands for managing variables a1-1-4 Demonstrate sufficient essential knowledge and a deep understanding to Matlab Programming . a1-1-5 Describe different effective techniques and program algorithms to analyze and design different engineering problems a1-1-6 Demonstrate sufficient essential knowledge and a deep understanding to the mathematical operation with arrays. a1-1-7 Explain the applications in numerical analysis programming for solving engineering problems. a1-1-8 Demonstrate a basic understanding of the optimization using the Matlab toolboxes
B. Intellectual skills	
B1-1 Apply the analytical approaches and its technological professional skills to develop techniques for identifing, formulating, solving, analyzing, and designing problems pertaining toto a M. Sc thesis, as well as the courses that affect his/her professional research practicein Electronics and Communication Engineering.	b1-1-1 Demonstrate algorithms and flowcharts approach (Problem solving) to solve problems related to electrical engineering problems. b1-1-2Interpret, analyze & evaluate the information to solve problems using computer.

C. Professional and practical skills	
C1-1 Apply knowledge of mathematics, science, information technology, design, numerical modeling, modern and principle of professional skills to solve engineering problems.	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating computer solutions related to electrical systems problems, using latest computer engineering techniques, skills, and tools.
C1-2 Use a wide range of computational and technical tools, techniques and lab equipment, includingpertaining software packages to analysis and design a process, component, or system related to his/her research topic in electronics and communications field.	c1-1-2 Use tools, techniques and software relevant to electronics and communications field.
C2-1 Write and evaluate a professional technical report pertaining to electronics and communications technical matters	c2-1-1 Write and evaluate a professional report on computer programming in solving problemsrelevant to electronics and communications field..
D. General and transferrable skills	

D2-1 Demonstrate efficient IT capabilities in such a way that serves in the development of him/ her professional practice and research.	d2-1-1 Use state-of-the-art computer tools for solving professional problems related to electrical systems.
D5-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge.	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about computer programming.
D8-1 Express a strong foundation of continuous learning so they can maintain their technical competency.	d8-1-1 Exhibit the ability to learn more about Matlab simulation tool boxes .

4- Course Contents

Week No.	*Topic*	*Lec. Hours*
Weeks 1& 2	INTRODUCTION: -What is the computer - Computer specifications - Computer Components	6
Weeks 3 & 4	COMPUTER LANGUAGES: - Language Classifications -Compiler and Interpreter	6
Weeks 5 , 6,7&8	GENERAL PRINCIPLES OF PROGRAMMING: -Algorithms -Flowcharts -Mathematical model -Introduction to Matlab programming	12
Weeks 9 ,10, 11&12	The Fundamental of Matlab - Languages: - Data Types - Relational Operators - Logical Operators - Assignment Operators	12
Weeks 13 ,14, 15 &16	DATA INPUT AND OUTPUT: 1-Introduction 2- Input Library Functions 3- Output Library Functions 4- Character arrays	12
Weeks 17,18, 19 &20	CONTROL STATEMENTS IN PROGRAMMING: 1-Introduction 2- The for Functions 3- The Nested for Function 4- The while Functions 5- The break , and continue functions 6- The if …then …. Else….end functions 7- The switch …. Case functions	12
Week	THE ARRAYS:	9

21,22 & 23	1-Introduction 2- The single dimensional numeric and character arrays 3- The Multi dimensional numeric and character arrays	
Week 24 & 25	THE FUNCTIONS M-FILES 1-Introduction 2- Function Definition 3- Function Call 4- Examples of Function	6
Week 26, 27 & 28	THE FILES: 1-Introduction 2- Opening and Closing a file 3- Read and write functions OPTIMIZATION and SIMULINK TOOLBOXES. 1-Introduction to optimization 2- Basic properties of solutions and algoritms 3- Introduction to simulink 4- Solving problems in time based	9

5- Relationship between the course and the program

Field	**NAQAAE Academic Reference Standards (ARS)**			
	Knowledge & Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards that the course contributes in achieving.	A1-1	B1-1	C1-1, C1-2, C2-1	D2-1, D5-1,D8-1

6- Course Subject Area:

A	B	C	D	E	F	G	
Humanities and Social Science	Mathematics and Basic Sciences	Basic Engineering Science	Applied Engineering And Design	Computer Applications and ICT	Projects and practice	Disccretionry subjects	Total
---	---	----	-	100	-		100%

7- Course Topics.

Topic No.	Topic	Week
1st	Introduction, and Definations of computer systems	1-2
2nd	Introdution to computer languages. Design Algorithms and flowcharts.	3-4
3rd	Define the Data Types, Relational Operators, Logical Operators and Assignment Operators	5-8
4th	Define the Input Library Functions and Output Library Functions	9-12
5th	Define the control statements in programming	13-16

6th	THE ARRAYS: Creating the single and two dimensional numeric and character arrays Mathematical operation with Array	17-20
7th	Define The FUNCTIONS AND FUNCTION FILES Function Definition Line Input and Output Arguments Local and global variables	21-23
8th	OPTIMIZATION and SIMULINK TOOLBOXES. Define the optimization techniques Define the basic properties of solutions and algoritms Using simulink for Solving proplems in time based	24-28

8- <u>ILOs Matrix Topics</u>

Course Intended Learning Outcomes (ILOs)		Course topics							
		1st	2nd	3rd	4th	5th	6th	7th	8th
Knowledge & Understanding	a1-1-1 Demonstrate sufficient essential knowledge and a deep understanding of the basic programming .	x	x						
	a1-1-2 Classify the basic elementary math built-in Functions.	x	x						
	a1-1-3 Classify the useful commands for managing variables.	x	x	x					
	a1-1-4 Demonstrate sufficient essential knowledge and a deep understanding to Matlab Programming .	x	x	x					
	a1-1-5 Describe different effective techniques and program algorithms to analyze and design different engineering problems	x	x	x	x				
	a1-1-6 Demonstrate sufficient essential knowledge and a deep understanding to the mathematical operation with arrays.	x	x	x	x	x			

	a1-1-7 Explain the applications in numerical analysis programming for solving engineering problems.						x	x	x
	a1-1-8 Demonstrate a basic understanding of the optimization using the Matlabtoolboxes.						x	x	x
Intellectual Skills	b1-1-1 Demonstrate algorithms and flowcharts approach (Problem solving) to solve problems related to electrical engineering problems.	x	x						
	b1-1-2Interpret, analyze & evaluate the information to solve problems using computer.		x	x					
Professional Skill	c1-1-1 Express competence skills, such as identifying, formulating, analyzing, and creating computer solutions related to electrical systems problems, using latest computer engineering techniques, skills, and tools.					x	x		
	c1-1-2 Use tools, techniques and software relevant to electronics and communications field.								
	c2-1-1 Write and evaluate a professional report on computer programming in solving problemsrelevant to electronics and communications field.						x	x	x
General Skills	d2-1-1 Use state-of-the-art computer tools for solving professional problems related to electrical systems.								x
	d5-1-1 Use different sources of information like library, internet access facilities, etc. to upgrade and enhance their conceptual knowledge about computer programming.							x	x
	d8-1-1 Exhibit the ability to learn more about Matlab simulation tool boxes .							x	x

9- Teaching and Learning Method:

Course Intended learning outcomes (ILOs)		Teaching and Learning Method (The teaching process will be done inside the computer Lab)												
		Lecture+ online sessions	Presentation and Movies	Discussion	Tutorial	Problem solving	Brain storming	Projects	Site visits	Self learning	Cooperative	Discovering	Computer Simulation	Playing
Knowledge & understanding	a-1-1	x				x								
	a-1-2	x				x							x	
	a-1-3	x				x							x	
	a-1-4	x				x							x	
	a-1-5	x				x								
	a-1-6	x				x							x	
	a-1-7	x				x							x	
	a-1-8	x				x							x	
Intellectual Skills	b1-1-1					x							x	
	b1-1-2					x							x	
Professional Skills	c-1-1-1					x							x	
	c-1-2-1					x							x	
	c-2-1-1					x							x	
General Skills	d-2-1-1					x				x			x	
	d-5-1-1					x				x			x	
	d-8-1-1					x				x			x	

10- Assessment

10.1 Assessment Methods

Final Written Examination : to assess students' knowledge, understanding, analysis, creativity, problem solving, and problem identification.

10.2 Assessment Schedule and Grades Distribution

Assessment Method	Percentage	week
Final Examination	100	Decided by the College Council
Total	100%	

11- Facilities required for teaching and learning

Internet for online sessions-Blackboard – Class Room Equipped with Computer and Video Projector - Computer Lab with Preinstalled MATLAB software package (last version) - Library.

A. laboratory Usage (During Lectures):

Students are expected to prepare and conduct some computer simulation assignments using MATLAB simulators using general computer labs during the class and/or at home.

B. Library Usage:

Students should be encouraged to use library technical resources in the preparation of reports and oral presentation. At least one oral presentation should involve a significant component of library research to encourage this component of study.

12- List of References:

Course Notes: NONE

Text Books:

1) Amos Gilat, MatlabAn introduction with Applications (2nd ed.) John Wiley & Sons, Inc,2005

2) Knuth, D., The Art of Computer Programming, vol. I: Fundamental Algorithms (2nd ed.). MA: Addison-Wesley, 1973

Recommended Books:

1) Amos Gilat, MatlabAn introduction with Applications (2nd ed.) John Wiley & Sons, Inc,2005

13- Program Coordination Committee:

Course Coordinator:	**Associate Prof. Dr. Ibrahim Elnahry**
Program coordinator:	**Assist. Dr. Saly Hassaneen**
Head of the Department:	**Prof. Dr. Rawya Yehia Rizk**

Date: 10/2020