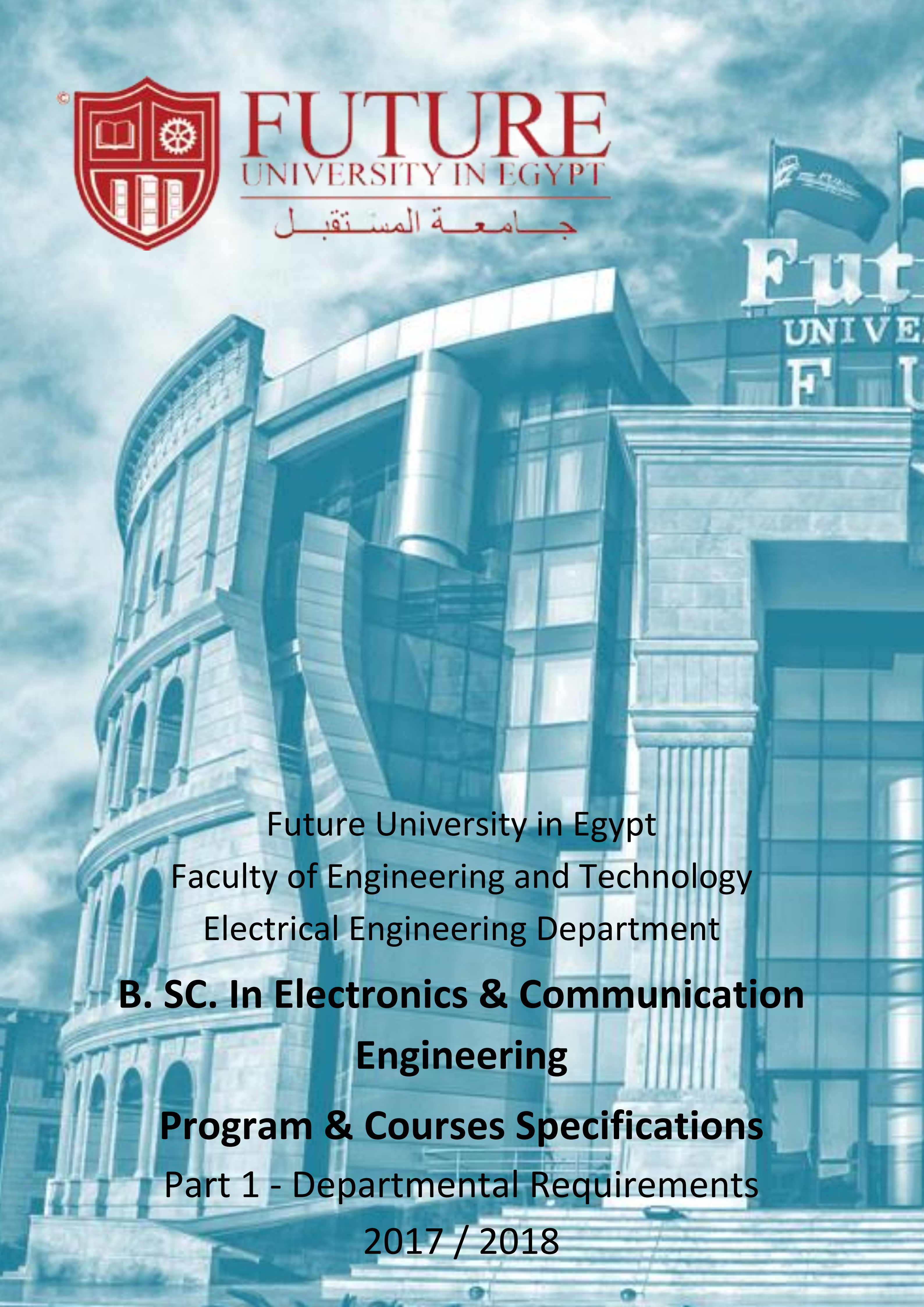

FUTURE

UNIVERSITY IN EGYPT

جـــامعـــة المســـتقبـــل

Future University in Egypt

Faculty of Engineering and Technology

Electrical Engineering Department

B. SC. In Electronics & Communication Engineering

Program & Courses Specifications

Part 1 - Departmental Requirements

2017 / 2018

Contents

Program Specifications of

B.Sc. in Electronic & Communication Engineering 2016/2017

University: Future University in Egypt **Faculty:** Engineering & Technology

A- Basic Information

1. **Program title :** B. SC. in Electronic & Communication Engineering
2. **Program type:** Single ☑ Double ☐ Multiple ☐
3. **Faculty:** Engineering & Technology
4. **Department offering the program :** Electrical Engineering
5. **Coordinator :** Dr. Omar Fahmy
6. **External evaluator(s) :** Prof. Dr. Ali El Moghazy; Dr. Mohamed abdel Hameed
7. **Internal evaluator(s) :** Prof. Dr. Ibrahim Salem & Prof. Dr. Kamel Hassan
8. **Bylaws approval: September 2006.**
9. **Last date of program specifications approval:**
   - **A. Department council: November 2017**
   - **B. Faculty council: November 2017**

B- Professional Information

1 The Program Aims

The program aims at shaping the fresh graduate to be able to:

PA - 1. Apply knowledge of mathematics, science and engineering.
PA - 2. Design and conduct experiments as well as analyze and interpret data.
PA - 3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
PA - 4. Function on multidisciplinary teams.
PA - 5. Identify, formulate and solve engineering problems.
PA - 6. Understand of professional and ethical responsibilities
PA - 7. Communicate effectively.
PA - 8. Understand the impact of engineering solutions in a global, economic, environmental, and societal context.
PA - 9. Recognize the need for, and engage in life-long learning.
PA - 10. Demonstrate knowledge of contemporary issues.
PA - 11. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
PA - 12. Participate in and lead quality improvement projects.
PA - 13. Manipulate with the electronic circuits all the way from the discrete components to circuits', and system levels.
PA - 14. Apply control theory and measurement principals for industrial variables, signal conversion, conditioning and processing.

PA - 15. Deal with the computer hardware, software, operating systems and interfacing.
PA - 16. Design, implement and operate digital and analog communication systems.
PA - 17. Analyze, design and implement the technology in the field of communication links including satellite, optical fiber and mobile communication systems.
PA - 18. Investigate the failure and develop innovative solution for electronic components, systems, and processes.

To shape the fresh graduate with these aims, the program is designed to target the following Intended Learning Outcomes (ILOs).

2 Program Intended learning outcomes (ILOs)

a- Knowledge and understanding:

By the end of the program the student should be able to demonstrate the knowledge and understanding of:

A1. Basic Sciences including classical and solid state physics, mechanics and chemistry.

A2. Topics related to humanities and general knowledge including business, management, Professional ethics, legislations, environmental engineering, technical language and report writing

A3. Basics of information and communication technology.

A4. Topics from other engineering disciplines including engineering graphics, civil engineering, production technology, thermodynamics and fluid mechanics.

A5. Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.

A6. Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems.

A7. Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.

A8. Principles and applications of photonics.

A9. Applying of the electrical, electronic, digital instrumentation, sensors and transducers in the biomedical technology.

A10. Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.

A11. Principles, theories, techniques and applications of classical and modern control systems.

A12. Theories, techniques, analysis of analog and digital signals processing.

A13. Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.

A14. Basic concepts of data transmission, data computer networks and secure communication.

A15. Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering.

A16. Analysis, techniques and applications of digital integrated circuits and nanotechnology.

A17. Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

b- Intellectual skills

Graduates should have ability to:

B1. Think in a creative and innovative way in problem solving and design.

B2. Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.

B3. Use software tools to develop computer programs for engineering applications.

B4. Plan, conduct and write a technical report on a project or an assignment.

B5. Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines.

B6. Apply different theories and techniques to model, evaluate the characteristics and solve problems of classical and modern control systems.

B7. Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth.

B8. Analyze and design communication systems based on the knowledge acquired.

B9. Combine, exchange, and assess different ideas and knowledge from range of sources for solving electronic and communication systems problems.

B10. Design and integrate digital systems for certain specific function using the appropriate components.

B11. Assess and evaluate the characteristics and performance of electronic components, systems and processes.

B12. Investigate the failure and develop innovative solution for electronic components, systems, and processes.

B13. Analyze the performance of microwave and antenna systems.

B14. Develop innovative solutions considering incorporate economic, environmental dimensions and risk management in the design of practical industrial problems.

B15. Analyze the performance of Photonic devices and systems.

c- Professional and practical skills

Graduates should have ability to:

C1. Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.

C2. Professionally merge the knowledge of electronic and communication systems to improve design, products and services.

C3. Design a process, component or system and practice the quality of electronic and communication systems.

C4. Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.

C5. Apply numerical modelling methods to microwave, antennas, electronic and communication systems.

C6 Perform practical measurements of the microwave, antenna, and communication links.

C7. Follow up safety requirements at work and observe the appropriate steps to manage risks.

C8. Apply quality assurance and follow the appropriate codes and standards.

C9. Exchange knowledge and skills with communication systems engineering community and industry.

C10. Edit and present technical report.

C11. Use the standard and appropriate tools to troubleshoot, maintain and repair the electronic systems.

C12. Read thoroughly datasheets and identify appropriate specifications for required system or device.

C13. Perform the practical measurements of the photonic devices and systems.

d- General and transferable skills

Graduates should have ability to:

D1. Collaborate effectively within multidisciplinary team.

D2. Work in stressful environment and within constraints.

D3. Communicate effectively.

D4. Demonstrate efficient IT capabilities.

D5. Lead and motivate individuals.

D6. Effectively manage tasks, time, and resources.

D7. Search for information and engage in life-long self-learning discipline.

D8. Acquire entrepreneurial skills.

D9. Refer to relevant literatures.

3 Academic standards

The department council adopted in the official meeting on **27th July 2016** The National Academic Reference Standards (NARS) for Bachelor degree of Electronic Engineering published by the National Authority for Quality Assurance and Accreditation of Education (NAQAAE -August 2009) to be the academic reference standards for Electronic & Communication Engineering program. The faculty council approved this adoption on **27th March 2017.**

4 Benchmarks

The department council adopted in the official meeting on **14th November 2016**. The Accreditation Board for Engineering and Technology (ABET) for Bachelor degree of Electrical Engineering published by the Engineering Accreditation Commission to be the academic reference standards for Electronic & Communication Engineering program. The faculty council approved this adoption on **27th March 2017.**

See matrix [1] for a mapping matrix of **"Program ILOs – NARS ILOs**".
See matrix [2] for a mapping matrix of **"Program Aims – NARS Graduates' Attributes**".
See matrix [3] for a mapping matrix of **"Institute's Mission Vs Program Aims** ".
See matrix [4] for a mapping matrix of **"Program Aims - Program ILOs**".
See matrix [5] for a mapping matrix of **"Program ILOs - Program Courses**.

5 Curriculum Structure and Contents

5.1 Programme duration:

Five Years, 10 semesters, 176 Credit Hours, 283 Contact Hours

5.2 Programme structure

Contact Hours Distribution		%
Lectures	164h	58%
Tutorial/lab	119h	42%
Total	283h	

Courses mandatory		%
Compulsory	161 Cr.H.	91%
Elective	15 Cr.H.	9%
Total	176 Cr.H.	

Courses Classification	No. of Courses	Cr.H	%	NARS Criteria %
Humanities and Social Sciences	8	16	9.1	9-12 %
Mathematics and Basic Sciences	12	35-1	19.3	20-26 %
Basic Engineering Sciences	16	45-4	23.3	20-23 %
Applied Engineering and Design	18	54-4	28.4	20-22 %
Computer Applications and ICT*	5	13-1+1	7.4	9-11 %
Design Projects and Practice	2	1+3+1+2+1+1+4+1	8	8-10 %
Discretionary subjects	3	9-1	4.5	6-8 %
Total	64	176	100	100 %

Table 4A: Humanities and Social Sciences

S.N.	Course Code	Course Title	Cr.H.
1	**ENG 101**	**English Language 1**	2
2	**ENG 102**	**English Language 2**	2
3	**UNV E01**	**University Elective Course 1**	2
4	**HUM 103**	**Human Rights**	2
5	**MAN 381**	**Managerial and Engineering Economics**	2
6	**UNV E02**	**University Elective Course 2**	2
7	**GEN 313**	**Report Writing and Presentation Skills**	2
8	**GEN 441**	**Law for Professional Engineers**	2
Total			**16**

Table 4B: Mathematics and Basic Sciences

S.N.	Course Code	Course Title	Cr.H.
1	MTH 111	Differentiation with Applications and Algebra	3
2	PHY 131	Physics 1*	4*
3	MEC 121	Mechanics 1	2
4	CHM 151	Chemistry 1*	2*
5	MTH 112	Integration with Applications and Analytical Geometry	3
6	PHY 132	Physics 2*	4*
7	MEC 122	Mechanics 2	2
8	MTH 211	Functions of Several Variables and Ordinary Differential Equations	3
9	PHY 232	Solid State Physics*	3*
10	MTH 212	Transformations and Numerical Analysis	3
11	MTH 311	Complex Variable and Special Functions	3
12	MTH 312	Probability and Statistics	3
Total			35
* courses have 10 % experimental work			1 Cr.H
Total Net			34 Cr.H

Table 4C: Basic Engineering Sciences

S.N.	Course Code	Course Title	Cr.H.
1	MAN 121	Production Technology**	2**
2	GRA 141	Graphics 1	2
3	GRA 142	Graphics 2	2
4	MPR 243	Thermodynamics and Fluid Mechanics	3
5	SCM 217	Civil Engineering	2
6	EPR 261	Electrical Circuits 1*	4*
7	ELE 213	Electronics*	4*
8	ELE 215	Logic Design and Digital Circuits*	3*
9	EPR 263	Electrical Circuits 2*	4*
11	ELE 364	Electronic Circuits*	4*
12	EPR 341	Energy Systems*	3*
13	COM 213	Electromagnetic Waves 1	3
14	COM 362	Signal Analysis	3
15	EPR 364	Electrical and Electronic Measurements*	3*
16	CMP 371	Control Systems 1	3
Total			45
* courses have 10 % experimental work			3 Cr.H.
** courses have 50 % experimental work			1 Cr.H.
Total Net			41

Table 4D: Applied Engineering and Design

S.N.	Course Code	Course Title	Cr.H.
1	CMP 472	Control Systems 2	3
2	COM 411	Communications 1[a,b]	3 [a,b]
3	COM 412	Communications 2 [a,b]	3 [a,b]
4	COM 520	Telecommunication Networks	3
5	COM 521	Antennas and Propagation*	3*
6	COM 523	Mobile Communication Systems	3
7	COM 524	Satellite Communication Systems	3
8	COM 561	Digital Signal Processing	3
9	ELE 521	Electronic Systems Design [a,b]	3 [a,b]
10	ELE 420	Electronic Devices [a,b]	3 [a,b]

11	ELE 412	Optical Electronics*	3*
12	ELE 570	Microelectronics Systems*	3*
13	COM 527	Optical Fiber Communication Systems*	3*
14	COM 415	Microwave Engineering*	3*
15	COM 413	Electromagnetic Waves 2	3
16	ELE 514	Microwave Electronic Devices	3
17	ELE 415	Analog Signal Processing [a,b]	3 [a,b]
18	EPR 441	Electric Machines*	3*
Total			54
* courses have 10 % experimental work			2 Cr.H
[a] courses have 5 % experimental work			1 Cr.H.
[b] courses have 5% experimental work based on ICT			1 Cr.H
Total Net			50 Cr.H

Table 4E: Computer Applications and ICT

S.N.	Course Code	Course Title	Cr.H.
1	CMP 101	Introduction to Computers	2
2	CMP 132	Computer Programming	2
3	CMP 334	Digital Systems & Computer Organization*	3*
4	CMP 351	Microprocessors & Applications*	3*
5	COM 526	Data Communication Systems*	3*
Total			13
* courses have 10 % experimental work based on ICT			1 Cr.H
Total Net			12 Cr.H

Table 4F: Projects and Practice Courses

S.N.	Course Code	Course Title	Cr.H.
1	COM 500	Graduation Project	4
2	COM 501	Graduation Project	0
Total			4

Table 4G: Discretionary (Institution character-identifying)

S.N.	Course Code	Course Title	Cr.H.
1	COM E01	Elective 1*	3*
2	COM E02	Elective 2*	3*
3	COM E03	Elective 3*	3*
Total			9
* courses have 10 % experimental work			1 Cr.H
Total Net			8 Cr.H

5.3 Suggested Schedule

Level 1 (Common to All Engineering Students)

First Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 111	Differentiation with Applications and Algebra	3	2	5	3	-
2	MEC 121	Mechanics 1	2	2	4	2	-
3	PHY 131	Physics 1	3	3	6	4	-
4	GRA 141	Graphics 1	1	3	4	2	-
5	CHM 151	Chemistry 1	2	2	4	2	-
6	CSC 101	Introduction to Computers	2	1	3	2	-
7	ENG 101	English Language 1	2	0	2	2	-
Total			**15**	**13**	**28**	**17**	

Second Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 112	Integration with Applications and Analytical Geometry	3	2	5	3	MTH 111
2	MEC 122	Mechanics 2	2	2	4	2	MEC 121
3	PHY 132	Physics 2	3	3	6	4	-
4	GRA 142	Graphics 2	1	3	4	2	GRA 141
5	CMP 132	Computer Programming	2	2	4	2	CSC 101
6	MAN 121	Production Technology	2	2	4	2	-
7	ENG 102	English Language 2	2	0	2	2	ENG 101
Total			**15**	**14**	**29**	**17**	

Level 2 (Common to All Electrical Engineering Students)

Third Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 211	Functions of Several Variables and Ordinary Differential Equations	3	2	5	3	MTH 112
2	PHY 232	Solid State Physics	3	2	5	3	PHY 132
3	MPR 243	Thermodynamics and Fluid Mechanics	3	2	5	3	PHY 131
4	EPR 261	Electrical Circuits 1	3	3	6	4	PHY 132
5	UNV E01	University Elective Course 1	2	0	2	2	
6	PSC 110	Human Rights	2	0	2	2	-
Total			**16**	**9**	**25**	**17**	

Fourth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 212	Transformations and Numerical Analysis	3	2	5	3	MTH 211
2	SCM 217	Civil Engineering	2	0	2	2	
3	ELE 213	Electronics	3	3	6	4	PHY 232 Co-requisite EPR 261
4	ELE 215	Logic Design and Digital Circuits	3	2	5	3	Co-requisite ELE 213
5	EPR 263	Electrical Circuits 2	3	3	6	4	EPR 261
6	MAN 381	Managerial and Engineering Economics	2	1	3	2	-
Total			**16**	**11**	**27**	**18**	

Level 3 (Common to All Electrical Engineering Students)

Fifth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 311	Complex Variable and Special Functions	3	2	5	3	MTH 211
2	CMP 334	Digital Systems and Computer Organization	3	2	5	3	ELE 215, CMP 132
3	ELE 364	Electronic Circuits	3	3	6	4	ELE 213
4	EPR 341	Energy Systems	3	2	5	3	EPR 263
5	COM 213	Electromagnetic Waves 1	3	2	5	3	MTH 212, PHY 132
6	UNV E02	University Elective Course 2	2	0	2	2	-
Total			**17**	**11**	**28**	**18**	

Sixth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec.	Ex/ Lab	Total	Cr.H	
1	MTH 312	Probability and Statistics	3	2	5	3	MTH 211
2	COM 362	Signal Analysis	3	2	5	3	EPR 261, MTH 211
3	CMP 351	Microprocessors and Applications	3	2	5	3	CMP 334
4	EPR 364	Electrical and Electronic Measurements	3	2	5	3	EPR 261, ELE 213
5	CMP 371	Control Systems 1	3	2	5	3	MTH 212
6	GEN 313	Report Writing and Presentation Skills	2	1	3	2	-
Total			**17**	**11**	**28**	**17**	

After finishing the sixth level, the student should practice engineering training within a proper engineering foundation for not less than four weeks every year. A report should be submitted to the department after finishing the training, which is considered as a graduation requirement.

Level 4 (Electronics & Communication Engineering)

Seventh Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/ Lab	Tot al	Cr H	
1	ELE 415	Analog Signal Processing	3	2	5	3	ELE 364
2	CMP 472	Control Systems 2	3	2	5	3	CMP 371
3	COM 411	Communications 1	3	2	5	3	COM 362
4	COM 413	Electromagnetic Waves 2	3	2	5	3	COM 213
5	ELE 420	Electronic Devices	3	2	5	3	ELE 364
6	EPR 441	Electrical Machines	3	2	5	3	EPR 341
Total			**18**	**12**	**30**	**18**	

Eighth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/ Lab	Tot al	CrH	
1	COM 415	Microwave Engineering	3	2	5	3	COM 413
2	COM 412	Communications 2	3	2	5	3	COM 411
3	ELE 412	Optical Electronics	3	2	5	3	PHY 232
4	ELE 570	Microelectronics Systems	3	2	5	3	ELE 420
5	COM E01	Elective 1	3	2	5	3	See List
6	COM 561	Digital Signal Processing	3	2	5	3	COM 362
Total			**18**	**12**	**30**	**18**	

Level 5 (Electronics & Communication Engineering)

Ninth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/ Lab	Tot al	Cr H	
1	ELE 514	Microwave Electronic Devices	3	2	5	3	COM 415
2	COM 527	Optical Fiber Communication Systems	3	2	5	3	ELE 412 , COM 412
3	COM 526	Data Communication Systems	3	2	5	3	COM 412
4	GEN 441	Law for Professional Engineers	2	1	3	2	
5	COM 520	Telecommunication Networks	3	2	5	3	COM 412
6	COM E02	Elective 2	3	2	5	3	See List
7	COM 500	Graduation Project	0	2	2	0	COM 412
Total			**17**	**13**	**30**	**17**	

Tenth Semester

No	Course		Weekly Hours				Prerequisite Courses
	Code	Title	Lec	Ex/ Lab	Tot al	Cr H	
1	COM 524	Satellite Communication Systems	3	2	5	3	COM 412
2	COM 523	Mobile Communication Systems	3	1	4	3	COM 412
3	ELE 521	Electronic Systems Design	3	2	5	3	ELE 420
4	COM 521	Antenna and Propagation	3	2	5	3	COM 415
5	COM E03	Elective 3	3	2	5	3	See List
6	COM 501	Graduation Project	0	4	4	4	COM 500
Total			**15**	**13**	**28**	**19**	

Registration for the graduation project is eligible when the student has no more than **42 credit hours** left for graduation. Work within the graduation project should continue for two semesters. The student will be evaluated at the end of the first semester. The student presents his project in front of a jury including the supervisor and external examiners from universities and industry. If the student fails, he/she will be given one semester more to fulfill the remarks of the jury.

6 Program admission requirements

Having Egyptian Secondary education or equivalent certificate with major in Mathematics.

7 Regulations for Registration, Progression and Program Completion

7.1 Registration Procedure

Before the start of each semester, students should register the courses which they select, in certain templates specially designed for this propose at the date specified by the faculty before the semester starts. The ordinary load for the semester ranges between 12 to 19 credit hours, the maximum load of the summer course is 9 credit hours. Excellent students are allowed to register up to 21 credit hours, subject to the approval of the academic advisor and the faculty Dean.

7.2 Course Withdrawal and Addition

After the primary registration, students are allowed to drop and add courses, during the first two weeks of the semester after the advice of the academic advisor and the approval of the faculty Dean. It is not possible to add any course to the student's time table after the end of the registration period. The student may withdraw from a course or more during the first 10 weeks provided that the number of remaining registered hours is not less than the minimum requirements of the semester. It is not allowed for a student to withdraw from a course after the allowed period (the first ten weeks of the semester) without an excuse acceptable to the faculty council. However, if the faculty council accepts the excuse, the student is then allowed to register once more in this course, and keeps his course grade.

7.3 Attendance and Absence

Attendance of lectures, tutorials and labs is considered to be an important issue in the educational process inside the program, as the student gets benefits from the interaction inside the class room between him and the staff members, teaching assistants and colleagues. Therefore, students should attend regularly so that their grades are not affected by their absences.

Students that do not attend a term exam without an excuse that his/her academic advisor and the course's instructor agree upon are not given a make-up examination. Students may be forced to withdraw from a course if the absence ratio exceeds 25% of the lectures and tutorials during the first 10 weeks of the semester, but if the absence ratio exceeds 25% after the first 10 weeks, students are not allowed to withdraw the course, attending lectures or attending the final term examination. The student gets grade (F) in this course. The students have to be warned at least once before preventing them from attending the examination.

The Final exam may be postponed for a student till the start of the next semester if he/she has an excuse accepted by the faculty council. In this case, the semester work mark is kept, and the student is allowed to enter the final exam at the beginning of the next semester, and gets a final grade (Incomplete) in this course in the semester in which he/she did not take the examination. This incomplete grade is changed to the actual grade obtained by the student in the postponed examination.

7.4 Semester Withdrawal

The student has the right to withdraw from an academic semester within the withdrawal period announced in the academic calendar of the semester. He/She will be considered to have failed if he withdraws after the aforementioned period, unless he has a valid reason which is acceptable to his/her advisor, and the faculty Dean.

7.5 System of Examinations

The final mark of a given course is composed of the sum of semester year work and the final examination mark. The total grade distribution of each type is as follows:

Final Exam	40%
Semester work (Assignments, Midterm Exams, Sketch designs, Design projects, Quizzes, and other similar things). The course instructor may suggest the suitable distribution for these marks	60%

Students are to be informed about their grades two times: 25% by the 6^{th} week and 50% by the 11^{th} week.

7.6 Grading System

At the end of the semester students receive a final grade in each course. The grade is the professor's official estimate of the student achievement as reflected in examinations, assignments and class participation. The final grades are recorded on the student permanent record at the Office of the University Registrar. The adjacent table illustrates the used grading system.

Grade	Range	Points
A	From 90% to 100%	4.0
A-	From 85 to < 90%	3.7
B+	From 80 to <85%	3.3
B	From 75 to < 80%	3.0
B-	From 70 to < 75%	2.7
C+	From 65 to < 70%	2.3
C	From 60 to < 65%	2.0
C-	From 55 to <60%	1.7
D+	From 53 to < 55%	1.3
D	From 50 to < 53%	1.0
F	Less than 50 %	0.0

The grade point average (G.P.A) is calculated as follows: G.P.A = (Sum of: the multiplication of the credit hours of each course by the points earned for that course) / (Total number of credit hours completed)

7.7 Repetition of courses in the case of failure

If a student fails a compulsory course in any semester, he/she should restudy this course. However, if he fails an elective course, he may restudy the same course or register in another elective course with the approval of the academic advisor. If the student succeeds a repeated course, the (F) grade remains in his academic record, but its mark is replaced by the new mark which is then used in calculating his G.P.A.

7.8 Repetition of courses for improving the G.P.A

A student is allowed to register one course or more in order to improve his G.P.A. In this case the student gets his new mark whatever its value and the old mark is removed with its credit hours from his academic record. In case a student wants to re-register a course for the second time, he/she has to take the permission of his advisor and the approval of the college council.

7.9 Registration for a student with low G.P.A.

If the G.P.A of a student in any semester drops below 2.0, he is put on probation (under close observation) for the next two semesters and is not allowed to register more than 12 credit hours in these semesters.

7.10 Degree Requirements

To be awarded the Bachelor of Science Degree in Architecture Engineering, students must earn 175 credit hours. The student must earn a grade of D or better in all the required courses and earn a grade-point average (GPA) of (C) or better in order to graduate. To get the rank of honor the student should have not failed any course during his study.

G.P.A	RATING	Rank of Honor *
3.7- 4.0	Distinction	First Rank
3.3 - Less than 3.7	Very Good	Second Rank
2.3 - Less than 3.3	Good	-
2.0 - Less than 2.3	Pass	-

8 Program ILOs Assessment Methods

The following table illustrates the assessment methods and what they assess in most cases. But for further details refer to the courses specifications.

	Program ILOs			
	K&U	Intellectual	Professional	General
Written Exams	■	■		
Practical Exams	■		■	■
Projects	■	■	■	■

9 Evaluation of program intended learning outcomes

Evaluator	Tool	Sample
1- Faculty Members	Evaluation sheet	100%
2- Senior students	Evaluation sheet	50%
3- Alumni	Evaluation sheet & interview	10%
4- Stakeholders (Employers)	Evaluation sheet & interview	5
5- External & Internal Reviewers	Evaluation report	1
6- Other		

Matrix [1]

			Program ILOs																
			A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13	A14	A15	A16	A17
		Check	2	4	1	1	2	2	4	3	1	3	1	3	5	0	4	6	1
NARS ILOs	a01	4	■				■			■							■		
	a02	2			■							■							
	a03	2	■							■									
	a04	3							■					■				■	
	a05	4					■	■				■			■				
	a06	1																	■
	a07	1		■															
	a08	6							■			■		■	■		■	■	
	a09	1		■															
	a10	1		■															
	a11	1		■															
	a12	1				■													
	a13	1						■											
	a14	2							■									■	
	a15	2							■									■	
	a16	1											■						
	a17	1									■								
	a18	1													■				
	a19	1													■				
	a20	1															■		
	a21	1															■		
	a22	1																■	
	a23	1								■									
	a24	1																■	
	a25	1												■					
	a26	1													■				

			Program ILOs														
			B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12	B13	B14	B15
		Check	1	1	2	1	2	2	0	3	1	2	1	2	1	3	0
NARS ILOs	b01	2		■	■												
	b02	3					■	■		■							
	b03	1	■														
	b04	1									■						
	b05	1											■				
	b06	1												■			
	b07	2					■	■									
	b08	1			■												
	b09	1														■	
	b10	1														■	
	b11	1								■							
	b12	1										■					
	b13	2												■		■	
	b14	1				■											
	b15	2								■					■		
	b16	1										■					

Program ILOs

NARS ILOs		C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13
	Check	2	1	2	3	1	1	2	1	1	1	2	1	1
c01	1	■												
c02	1		■											
c03	1			■										
c04	1			■										
c05	1				■									
c06	1											■		
c07	1					■								
c08	1							■						
c09	1							■						
c10	1								■					
c11	1									■				
c12	1										■			
c13	1	■												
c14	1				■									
c15	1				■									
c16	1											■		
c17	1												■	
c18	2						■							■

			Program ILOs								
			D01	D02	D03	D04	D05	D06	D07	D08	D09
		Check	1	1	1	1	1	1	1	1	1
NARS ILOs	d01	1									
	d02	1									
	d03	1									
	d04	1									
	d05	1									
	d06	1									
	d07	1									
	d08	1									
	d09	1									

Matrix [2]

Program Aims

NARS Attributes		PA - 1	PA - 2	PA - 3	PA - 4.	PA - 5	PA - 6	PA - 7	PA - 8	PA - 9	PA - 10	PA - 11	PA - 12	PA - 13	PA - 14	PA - 15	PA - 16	PA - 17	PA-18
General Engineering	(a)	■																	
	(b)			■															
	(c).		■																
	(d)					■													
	(e).											■							
	(f)				■														
	(g)							■											
	(h)								■										
	(i)										■								
	(j)						■												
	(k)									■									
Electronic Engineering	(a)												■						
	(b)													■					
	(c).														■				
	(d)															■			
	(e).																■		

Matrix [3]

		Faculty's Mission: The Faculty of Engineering and Technology, Future University provides a promising academic and cultural environment that enables:				
		Outstanding Engineers.	**Local and regional competition.**	**Professionalism and ethics.**	**Conducting scientific research.**	**Community development.**
Program Aims	PA - 1.					
	PA - 2.					
	PA - 3.					
	PA - 4.					
	PA - 5.					
	PA - 6.					
	PA - 7.					
	PA - 8.					
	PA - 9.					
	PA - 10.					
	PA - 11.					
	PA - 12.					
	PA - 13.					
	PA - 14.					
	PA - 15.					
	PA - 16.					
	PA - 17.					
	PA-18.					

Matrix [4]

Program ILOs	PA - 1	PA - 2	PA - 3	PA - 4.	PA - 5	PA - 6	PA - 7	PA - 8	PA - 9	PA - 10	PA - 11	PA - 12	PA - 13	PA - 14	PA - 15	PA - 16	PA - 17	PA-18
A01	X																	
A02						X		X										
A03											X				X			
A04	X																	
A05	X																	
A06					X													
A07					X					X			X					
A08										X								
A09											X			X				
A10					X					X					X			
A11			X											X				
A12										X				X				
A13					X					X						X	X	
A14										X					X			
A15										X							X	
A16										X			X					
A17								X										

Program ILOs	PA - 1	PA - 2	PA - 3	PA - 4.	PA - 5	PA - 6	PA - 7	PA - 8	PA - 9	PA - 10	PA - 11	PA - 12	PA - 13	PA - 14	PA - 15	PA - 16	PA - 17	PA-18
B1.									■									
B2.	■																	
B3.											■				■			
B4.									■									
B5.					■													
B6.					■									■				
B7.										■						■		
B8.		■			■											■		
B9.					■													
B10		■									■							
B11			■										■					
B12								■										■
B13										■							■	
B14			■															
B15										■								

Program ILOs	Program Aims																	
	PA - 1	PA - 2	PA - 3	PA - 4.	PA - 5	PA - 6	PA - 7	PA - 8	PA - 9	PA - 10	PA - 11	PA - 12	PA - 13	PA - 14	PA - 15	PA - 16	PA - 17	PA-18
C1.	■																	
C2.					■						■					■		
C3.		■	■															
C4.			■												■			
C5.										■							■	
C6											■			■			■	
C7.						■		■										
C8.								■										
C9.										■						■		
C10								■										
C11											■							
C12									■			■						
C13										■								

Program ILOs	PA - 1	PA - 2	PA - 3	PA - 4.	PA - 5	PA - 6	PA - 7	PA - 8	PA - 9	PA - 10	PA - 11	PA - 12	PA - 13	PA - 14	PA - 15	PA - 16	PA - 17	PA-18
D1				1														
D2			1									1						
D3							1											
D4											1				1			
D5				1								1						
D6									1									
D7									1									
D8											1							
D9										1								

Matrix [5]

			1st Semester					2 nd Semester					
			MTH 111	MEC 121	PHY 131	GRA 141	CHM 151	MTH 112	MEC 122	PHY 132	GRA 142	CMP 132	MAN 121
		Course Code	2	2	5	3	5	2	2	5	3	6	3
Program ILOs	A01	11		1	1		1		1	1			
	A02	15											
	A03	10										1	
	A04	5				1					1		1
	A05	17	1					1					
	A06	5											
	A07	19											
	A08	4											
	A09	3											
	A10	7											
	A11	2											
	A12	10											
	A13	18											
	A14	12											
	A15	8											
	A16	11											
	A17	4											
	B01	36				1					1		1
	B02	38	1	1	1		1	1	1	1			
	B03	20										1	
	B04	9											
	B05	6											
	B06	2											
	B07	9											
	B08	14											
	B09	5											
	B10	8											
	B11	17											
	B12	4											
	B13	6											
	B14	2											
	B15	4											
	C01	26			1	1	1			1	1		1
	C02	6											
	C03	13											
	C04	29										1	
	C05	5											
	C06	5											
	C07	10											
	C08	4											
	C09	3											
	C10	24											
	C11	4											
	C12	13											
	C13	2											
	D01	49			1		1			1		1	
	D02	13											
	D03	54			1					1		1	
	D04	10											
	D05	4											
	D06	38											
	D07	28					1					1	
	D08	3											
	D09	17											

Course ILOs

			3 rd Semester				4 th Semester					
			MTH 211	PHY 232	MPR 243	EPR 261	MTH 212	SCM 217	ELE 213	ELE 215	MAN 381	EPR 263
		Course Code	2	5	10	8	2	3	12	10	5	8
Program ILOs	A01	11		1	1							
	A02	15									1	
	A03	10										
	A04	5			1			1				
	A05	17	1			1	1	1				1
	A06	5				1						1
	A07	19							1			
	A08	4										
	A09	3										
	A10	7								1		
	A11	2										
	A12	10										
	A13	18										
	A14	12										
	A15	8										
	A16	11										
	A17	4										
	B01	36			1				1	1	1	
	B02	38	1	1			1	1			1	
	B03	20							1			
	B04	9										
	B05	6				1						1
	B06	2										
	B07	9										
	B08	14										
	B09	5										
	B10	8								1		
	B11	17							1			
	B12	4							1			
	B13	6										
	B14	2										
	B15	4										
	C01	26		1					1	1		
	C02	6										
	C03	13										
	C04	29			1	1			1	1		1
	C05	5										
	C06	5										
	C07	10			1							
	C08	4										
	C09	3										
	C10	24			1	1						1
	C11	4										
	C12	13							1	1		
	C13	2										
	D01	49		1	1	1			1	1	1	1
	D02	13										
	D03	54		1		1			1	1	1	1
	D04	10										
	D05	4			1							
	D06	38			1	1			1	1		1
	D07	28							1	1		
	D08	3										
	D09	17			1							

			5 th Semester					6 th Semester					
			MTH 311	CMP 334	ELE 364	EPR 341	COM 213	MTH 312	COM 362	CMP 351	CMP 371	EPR 364	GEN 313
		Course Code	2	13	13	8	4	2	10	9	4	10	4
Program ILOs	A01	11					1						
	A02	15											1
	A03	10											
	A04	5											
	A05	17	1				1	1	1				
	A06	5				1							
	A07	19			1								
	A08	4											
	A09	3								1		1	
	A10	7		1									
	A11	2									1		
	A12	10							1				
	A13	18											
	A14	12											
	A15	8					1						
	A16	11											
	A17	4											
	B01	36		1	1	1	1		1	1	1		
	B02	38	1					1					
	B03	20		1	1					1			
	B04	9		1	1						1	1	1
	B05	6				1						1	
	B06	2									1		
	B07	9											
	B08	14											
	B09	5							1				
	B10	8		1						1			
	B11	17			1								
	B12	4										1	
	B13	6											
	B14	2											
	B15	4											
	C01	26		1	1								
	C02	6											
	C03	13		1	1								
	C04	29		1	1				1	1		1	
	C05	5											
	C06	5				1							
	C07	10										1	
	C08	4											
	C09	3											
	C10	24				1			1				1
	C11	4										1	
	C12	13		1	1								
	C13	2											
	D01	49		1	1	1				1		1	
	D02	13											
	D03	54		1	1	1			1	1		1	1
	D04	10								1			
	D05	4											
	D06	38		1	1	1			1	1		1	
	D07	28		1	1				1				
	D08	3											
	D09	17							1				

		7 th Semester						8 th Semester				
		ELE 415	CMP 472	COM 411	COM 413	ELE 420	EPR 441	COM 412	COM 415	ELE 412	ELE 570	COM 561
Program ILOs	Course Code	16	5	14	8	11	8	14	7	13	11	5
A01	11				1					1		
A02	15											
A03	10			1				1				
A04	5											
A05	17	1	1									1
A06	5						1					
A07	19	1				1				1	1	
A08	4									1		
A09	3											
A10	7										1	
A11	2		1									
A12	10	1		1				1				1
A13	18			1				1				
A14	12			1				1				
A15	8				1				1			
A16	11					1					1	
A17	4				1							
B01	36	1	1		1							1
B02	38	1		1	1	1		1		1	1	
B03	20	1	1									1
B04	9											1
B05	6						1					
B06	2		1									
B07	9			1				1				
B08	14	1		1				1				
B09	5											
B10	8										1	
B11	17					1			1	1	1	
B12	4											
B13	6								1			
B14	2											
B15	4									1		
C01	26	1		1				1			1	
C02	6											
C03	13	1										
C04	29	1		1			1	1				
C05	5					1			1			
C06	5				1				1			
C07	10						1			1		
C08	4											
C09	3											
C10	24	1				1	1			1	1	
C11	4			1				1				
C12	13	1								1	1	
C13	2									1		
D01	49	1		1		1	1	1	1	1	1	
D02	13						1					
D03	54	1			1	1			1	1	1	
D04	10											
D05	4											
D06	38	1		1		1	1	1		1		
D07	28	1		1		1		1				
D08	3											
D09	17			1	1	1		1				

			9 th Semester					10 th Semester				
			ELE 514	COM 527	COM 526	COM 520	COM 500	COM 524	COM 523	ELE 521	COM 521	COM 501
		Course Code	12	15	12	6	35	6	5	12	8	35
Program ILOs	A01	11	1									
	A02	15										
	A03	10			1	1						
	A04	5										
	A05	17						1				
	A06	5										
	A07	19	1				1			1		1
	A08	4		1			1					1
	A09	3										
	A10	7					1			1		1
	A11	2										
	A12	10					1					1
	A13	18	1	1	1	1	1	1	1		1	1
	A14	12			1	1	1		1			1
	A15	8	1				1				1	1
	A16	11					1			1		1
	A17	4					1					1
	B01	36			1	1	1	1	1			1
	B02	38	1	1	1					1	1	
	B03	20			1	1	1		1			1
	B04	9										
	B05	6										
	B06	2										
	B07	9		1			1	1				1
	B08	14		1		1	1	1	1			1
	B09	5					1					1
	B10	8					1			1		1
	B11	17	1							1		
	B12	4					1					1
	B13	6	1				1	1			1	1
	B14	2					1					1
	B15	4		1			1					1
	C01	26		1	1					1		
	C02	6					1					1
	C03	13		1			1					1
	C04	29		1	1		1					1
	C05	5	1									
	C06	5		1							6	
	C07	10					1				6	1
	C08	4					1					1
	C09	3					1					1
	C10	24			1		1			1		1
	C11	4										
	C12	13		1						1		
	C13	2		1								
	D01	49	1				1			1		1
	D02	13	1	1			1				1	1
	D03	54	1	1	1		1			1	1	1
	D04	10			1		1					1
	D05	4					1					1
	D06	38	1	1	1		1			1		1
	D07	28					1					1
	D08	3					1					1
	D09	17					1					1

			Department Electives																	
			COM 581	ELE 511	ELE 564	ELE 562	COM 522	COM 525	COM 530	COM 531	COM 582	COM 583	COM 584	ELE 522	ELE 524	ELE 525	ELE 526	ELE 561	ELE 563	EPR 442
		Course Code	11	8	19	11	12	13	10	9	14	5	11	11	11	10	11	12	11	10
Program ILOs	A01	11																		
	A02	15																		
	A03	10						1	1		1		1							
	A04	5																		
	A05	17						1			1									
	A06	5																		1
	A07	19		1	1	1								1	1	1	1	1	1	
	A08	4																		
	A09	3					1													
	A10	7							1											
	A11	2																		
	A12	10	1		1				1											
	A13	18	1		1		1		1	1	1	1								
	A14	12					1	1			1	1	1							
	A15	8							1											
	A16	11				1								1	1	1		1	1	
	A17	4								1										
	B01	36			1	1		1	1		1	1	1				1		1	1
	B02	38	1	1	1			1	1	1	1		1	1	1	1		1		
	B03	20	1		1			1			1	1					1			
	B04	9			1			1	1											
	B05	6																		1
	B06	2																		
	B07	9					1		1		1									
	B08	14			1		1			1	1	1								
	B09	5			1				1											
	B10	8																1		
	B11	17		1	1	1								1	1	1	1	1	1	
	B12	4																		
	B13	6																		
	B14	2																		
	B15	4																		
	C01	26	1	1	1	1		1			1		1						1	
	C02	6			1		1	1					1							
	C03	13	1		1		1			1							1	1	1	
	C04	29		1	1	1	1									1	1	1	1	1
	C05	5												1	1					
	C06	5																		
	C07	10																		1
	C08	4								1										
	C09	3																		
	C10	24		1	1									1	1	1		1		1
	C11	4											1							
	C12	13	1		1	1											1			
	C13	2																		
	D01	49		1	1	1	1	1		1	1		1	1	1	1	1	1	1	1
	D02	13					1													1
	D03	54				1		1		1	1		1	1	1	1	1	1	1	1
	D04	10	1		1			1			1		1							
	D05	4					1													
	D06	38	1		1	1	1	1		1			1	1	1	1	1	1	1	1
	D07	28	1	1		1								1	1	1	1	1	1	
	D08	3																		
	D09	17	1								1			1	1					

Program ILOs		Faculty Electives		University Electives												Summer Training
		ARC 582	GEN 441	BSA H01	CSC 101	ENG 101	ENG 102	ENG H02	ENV 101	HUM H05	HUM H09	PSC 110	PSY 101	SCT 101	SOC 101	
	Course Code	4	2	3	6	4	4	4	4	2	2	4	3	4	4	12
A01	11															
A02	15	1	1	1		1	1	1	1	1	1	1	1	1	1	
A03	10				1											
A04	5															
A05	17															
A06	5															
A07	19															
A08	4															
A09	3															
A10	7															
A11	2															
A12	10															
A13	18															
A14	12															
A15	8															
A16	11															
A17	4															
B01	36	1		1												
B02	38															
B03	20				1											
B04	9															
B05	6															
B06	2															
B07	9															
B08	14															
B09	5															
B10	8															
B11	17															
B12	4															
B13	6															
B14	2															
B15	4															
C01	26															
C02	6															
C03	13															
C04	29				1											
C05	5															
C06	5															
C07	10	1														1
C08	4															1
C09	3															1
C10	24			1												1
C11	4															
C12	13															
C13	2															
D01	49				1	1	1	1	1							1
D02	13											1	1	1	1	1
D03	54		1		1	1	1	1	1	1	1	1	1	1	1	1
D04	10															1
D05	4															
D06	38															1
D07	28	1			1							1		1	1	1
D08	3															1
D09	17					1	1	1	1							1

Electronics & Communication Courses (COM & ELE)

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

Com 213 Electromagnetic Waves (1)

Programme(s) on which the course is given: B.Sc. in Electronic & Communication Engineering And Electrical Power Engineering.
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic year/Level: Level 3 - 5th semester.
Date of specification approval: November 2017

A- Basic Information

Title: Electromagnetic Waves (1) **Code: COM 213**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: **PHY 132 , MTH 311**

B- Professional Information

1- Catalog Course Description:

Different coordinate systems used in solving vector field problems. Coulomb's law-relation of electric field intensity with different charges, the electric flux density, Gauss' law and the divergence theorem. Relation between the electric field and the force exerted on charges, and energy expended in this motion. The potential gradient, and the dipole moment. The application of the previous laws to some materials – conductors-semiconductors- and dielectrics. Boundary conditions. Definition of susceptibility and permittivity. Laplace and Poisson equations in three coordinate systems, example of their solution. Relation of steady magnetic field, its curl, and Stoke's theorem. Maxwell' equations. Faraday' law. Magnetization, relation between magnetic flux density and magnetic field. Magnetic reluctance and magnetic circuit. Magnetic materials. .

2- Overall aims of the course:

The Main Goals of this course are:

- Enrich students' knowledge of fundamentals of steady electric and magnetic fields
- Prepare the students to analyze different magnetic circuits.
- Prepare the students to use Gauss's, Stoke's, and Maxwell' equations.

3- Intended learning outcomes of course (ILOs):

a- <u>Knowledge and understanding:</u>

By the end of this course the student should be able to:

a1. Recognize the electric field due to different charges.
a2. Estimate the proper equation to find the electric flux.
a3. Select different coordinates for solving electrostatic problems.
a4. Explain different magnetic circuits.
a5. Estimate the electric and magnetic forces and stored energies.

b- <u>Intellectual skills:</u>

By the end of this course the student should be able to:

b1. Compare between the different boundary conditions for electric and magnetic fields.
b2. Investigate the best current intensity suitable to create a necessary magnetic flux density.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	Vector analysis	3	2	5
2	Coulomb's law, Force, Electric field	6	4	10
3	Flux, Flux density, Gauss' law	6	4	10
4	Divergence law	3	2	5
5	Energy and potential	3	2	5
6	Material; conductors, semiconductors,. &midterm 1	6	4	10
7	Dielectrics and capacitors	3	2	5
8	Steady state magnetic fields, Faraday' law	6	4	10
9	Magnetic flux, flux density, current & midterm **2**	3	2	5
10	Magnetic materials	3	2	5
11	Magnetic circuits	3	2	5
	Total	**45**	**30**	**75**

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Final exam: 40%
- Semester work:
  - In Class Quizzes 20%
  - Assignment 50%
  - Performance 10%

  For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book: W.H. Hayat, J. A. Buck," Engineering Electromagnetics" McGraw Hill, 8th edition , 2012.
2. Handouts
3. Recommended Readings:
   John Kraus, Daniel Fleisch," Electromagnetics" McGraw Hill, 5th edition

9- Facilities required for teaching and learning:

- White board

Course coordinator:	**Prof. Dr. Ibrahim A. Salem**
Head of Department:	**Prof. Dr. Kamel Hasan**
Date:	**November - 2017**

Appendix

Table [1A] Course ILOs/Program ILOs Matrix (Electronics and Communication)

		Program ILOs			
		A1	A5	A15	B1
		Basic Sciences including classical and solid state physics, mechanics and chemistry.	Mathematics including differential and integral calculus, algebra and analytical geometry,	Principles of the electromagnetic theory, applications of the microwave engineering, microwave	Think in a creative and innovative way in problem solving and design.
Course ILOs	a1				
	a2				
	a3				
	a4				
	a5				
	b1				
	b2				

Table [1B] Course ILOs/Program ILOs Matrix (Electrical Power)

		Program ILOs		
		A1	A2	B3
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, numerical analysis, complex & special functions, statistics and their applications	Fundamentals of electrical engineering including DC/AC electrical circuits, electronic devices and circuits, electromagnetic fields, and electrical and electronic instrumentation.	Think in a creative and innovative way in problem solving and design.
Course ILOs	a1			
	a2			
	a3			
	a4			
	a5			
	b1			
	b2			

Table [2] Course Topics / Course ILOs

	Knowledge & Understanding					Intellectual skills	
Topic	a1	a2	a3	a4	a5	b1	b2
Vector analysis							
Coulomb's law, force& electric field							
Flux, flux density, Gauss' law							
Divergence law							
Energy and potential							
Material, conductors, semiconductors							
Steady state magnetic fields, Faraday' law							
Magnetic materials							
Magnetic circuits							

Table [3]: learning/teaching Method/ Course ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2
Lecture							
Research							
Studio Work							

Table [4]: Assessment Method/ Course ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2
Assignments							
Research							
Midterm & Final Exam							
Overall Percentage	10%	20%	10%	20%	10%	10%	10%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 362: Signal Analysis

Programme(s) on which the course is given: B.Sc. in Electronics and Communication Engineering & Electrical Power Engineering

Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level	Level 3 – 6th Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Signal Analysis **Code: COM 362**

Credit Hours: **3 Cr. Hrs.**

Lectures: **3 Hrs.**

Tutorial/Lab: **2 Hrs.**

Total: **5 Hrs.**

Prerequisite: **EPR 261 (**Electrical Circuits 1)**, MTH 211** (Functions Of Several Variables and Ordinary Differential Equations)

B- Professional Information

1- Catalog Course Description:

Continuous and discrete time signals and systems, Continuous time convolution, Discrete time convolution, Fourier series representation of periodic signals: Fourier representation of continuous time periodic signals, Fourier series representation of discrete time periodic signals, The continuous-time Fourier transform: the Fourier transform for periodic signals, the properties of continuous-time Fourier transform, The discrete-time Fourier transform: representation of a periodic signals, the discrete Fourier transform for periodic signals, properties of the discrete-time Fourier transform.

Overall aims of the course:

The Main Goals of this course are:

- Develop students' knowledge about signals and systems.
- Develop students' skills about using software tools in signal analysis
- Share ideas and work in a team or a group.

2- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should, be able to:

a1. Illustrate the application of mathematics in analog signals and systems description and classification.
a2. List the main properties of convolution integral and applications
a3. List the different types of analogue signals and systems.
a4. Define Fourier series and transforms and its properties.

b- Intellectual skills:

By the end of this course the student should, be able to:

b1. Analyse the analogue signals in time and frequency domains.
b2. Analyse analogue systems in time and frequency domains, examples on electric systems

c- Professional and practical skills:

By the end of this course the student should, be able to:

c1. Use MATLAB in signal analysis
c2. Present and discuss technical report

d-General and transferable skills:

By the end of this course the student should, be able to:

d1. Communicate effectively with other people using visual, graphic, written and verbal means.
d2. Manage time to meet deadlines.
d3. Search for information for self-learning
d4. Refer to relevant literatures in report writing

3- Course ILOs versus Program ILOs relation

See Appendix, table [1]

4- Course Contents:

#	Topics	Lec.	Tut.	Total
1	Basic concepts of analogue signals	9	6	15
2	Basic concepts of analogue systems	12	8	20
3	Convolution integral and properties	12	8	20
4	Fourier series and Fourier transform	12	8	20
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

5- learning/teaching methods:

See Appendix, table [3]

6- Assessment

- Final exam:..........40%
- Semester work:
  - In Class Quizzes..........10%
  - 2 Midterms 30%

- Performance/assignments...20%

For the relation between the course “Intended Learning Outcomes” (ILOs) and the used assessment method see Appendix, table [4]

7- List of references:

1. Text Book:
   Ashok Ambardar, Analog and digital signal processing, 2nd Edition, 2011
2. Recommended Readings:
   Alan V. Oppenheim ‘Signals and Systems ‘,2nd Edition

8- Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: **Dr. Kamel Hassan**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs (Electronics & Communication)									
		A05	A12	B01	B09	C04	C10	D03	D06	D07	D09
		Mathematics including differential and integral calculus, algebra and analytical geometry ,differential equations ,Fourier analysis ,vector analysis ,numerical analysis ,complex & special functions ,statistics and their applications to electrical engineering Basics of information and communication technology	Theories, techniques analysis of analogue signals and digital signal processing.	Think in a creative and innovative way in problem solving and design	Combine , exchange and assess different ideas and knowledge from range of sources for solving electronic and communication system problems	Use computational facilities and related software tools ,measuring instruments workshops and relevant laboratory equipment to design and diagnosis experiments, collect data ,analyse and interpret results	Edit and present technical report.	Communicate effectively	Effectively manage tasks, time, and resources.	Search for information and engage in life – long self-learning discipline.	Refer to relevant literatures.
Course ILOs	a1.										
	a2.										
	a3.										
	a4.										
	b1.										
	b2.										
	c1.										
	c2										
	d1										
	d2										
	d 3										
	d4										

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs (Electric Power)									
		A01	A12	B01	B03	C03	C08	D03	D06	D07	D09
		Mathematics including differential and integral calculus, algebra and analytical geometry ,differential equations ,Fourier analysis ,vector analysis ,numerical analysis ,complex & special functions ,statistics and their applications to electrical engineering Basics of information and communication technology	Fundamentals of electrical engineering including DC/AC electrical circuits, signals & System, electronic devices and circuits, electromagnetic fields, and electrical and electronic instrumentation.	Apply mathematics and physics knowledge to solve engineering problems.	Think in a creative and innovative way in problem solving and design	Use computational facilities and related software tools ,measuring instruments workshops and relevant laboratory equipment to design and diagnosis experiments, collect data ,analyse and interpret results.	Prepare and present technical report.	Communicate effectively	Effectively manage tasks, time, and resources.	Search for information and engage in life – long self-learning discipline.	Refer to relevant literatures.
Course ILOs	a5.										
	a6.										
	a7.										
	a8.										
	b3.										
	b4.										
	c2.										
	c2										
	d1										
	d2										
	d 3										
	d4										

Table (2) :course contents /ILO matrix

	Knowledge & Understandings				Intellectual Skills		Practical Skills		General Skills			
Topic	a1	a2	a3	a4	b1	b2	c1	c2	d1	d2	d3	d4
Basic concepts of analogue signals												
Basic concepts of analogue systems												
Convolution integral and properties												
Fourier series and Fourier transform												

Table (3): Teaching Methods / Course ILOs

	Knowledge & Understanding				Intellectual Skills		Practical Skills		General Skills			
Topic	a1	a2	a3	a4	b1	b2	c1	c2	d1	d2	d3	d4
Interactive Lecturing												
Discussion												
Problem Solving												
Assignments/Research												

Table (4) Assessment / Course ILOs

Topic	a1	a2	a3	a4	b1	b2	c1	c2	d1	d2	d3	d4
Assignments												
Quizzes												
Midterm & Final Exam												
Overall Percentage	10%	5%	5%	5%	15%	15%	10%	10%	10%	5%	5%	5%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 411: Communications 1

Programme(s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level 4 – 7^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Communications 1 **Code: COM 411**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	COM 362: Signal Analysis

B- Professional Information

1- Catalogue Course Description:

History of communication, Communication systems: block diagram, transmission media, frequency bands, fundamental limits, Shannon, s equation, linear and nonlinear distortion, noise (internal and external noise sources). Energy and power spectral densities. Amplitude modulation (conventional AM, SSB, DSB and VSB) and demodulation, Angle modulation and demodulation (PM and FM), Automatic gain control, Automatic frequency control, FDM Systems, Broadcast transmitters and receivers (AM SSB and FM) and circuits (Detectors, Mixers, Automatic gain control, Automatic frequency control, Phase-locked-loop, Applications of class C RF power amplifiers: limiters, harmonic generators and amplitude modulators, FM stereo broadcast transmitters and receivers.

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

- Understand the function of each basic element of a communication system and its fundamental limits.
- Understand the principles of operation of analog modulation techniques.
- Analyze and compare practical analog modulations and their applications on radio transmitters and receivers.

- Execute the basic calculations of the link budget in guided and unguided channels as well as noise calculations.
- To build up the appropriate experimental set-up schemes to evaluate the basic parameters of analog communication systems.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

`
a1. Mmemorize the technical terminology in communication engineering.
a2. Explain the basic elements of a communication system.
a3. Classify different types of analogue modulation techniques in communication systems.
a4. Explain different types of amplitude and frequency modulation and their applications in radio transceivers.
a5. Explain coherent and non-coherent detection methods in communication systems.

b- Intellectual skills:

b1. Manage the power budget for guided and unguided communication channels.
b2. Analyze channel performance in communication systems in terms of noise and channel capacity.
b3. Develop the calculations of the PSD, ESD, the essential BW of an energy signal, and the input-output power relationship of a communication system.
b4. Develop the basic calculations for AM and FM signals.
b5. Compare different types of modulation techniques.

c- Professional and practical skills:

c1. Formulate data and requirements for designing a simple analog communication system.
c2. Able to choose the appropriate modulation technique for a certain application
c3. Develop the appropriate scheme to measure the main parameters of analog communication systems.
c4. Validate the performance of radio receivers and radio transmitters.

d- General and transferable skills:

d1. Demonstrate the ability to work in a self-directed manner.
d2. Show the ability to work coherently and successfully as a part of a team in the Lab., projects, and assignments.
d3. Accomplish the planned time schedule and meet deadlines.
d4. Attempt the use the Internet in searching for information about basic elements in communication system applications.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Communication History, basic definitions, Elements of comma. .system.	3	2	5
2	Contaminations: 1.Attenuation (guided &Unguided Channels) 2. Distortion, 3. Interference, and 4. Noise.	3	2	5
3	Shannon and Hartly Theorem Noise sources (Internal &External). Linear Distortion	3	2	5
4	Linear Distortion: Distortion-less Transmission,	6	4	10

	Equalization, Multipath effect. Fading. Nonlinear distortion			
5	Energy Spectral Density (ESD), Power spectral Density (PSD)	3	2	5
6	Amplitude Modulation. DSB-SC, generation methods, basic Equations, Detection, methods. DSB-FC, generation and detection Basic equations and measurements.	6	4	10
7	SSB-SC. Basic Equations, Hilbert Transform Generation: Filtering method, NL modulator, and phasing method. DSB-FC	6	4	10
8	AM Radio Transmitters: Block diagram, Main Specs. Measurements of Main Specs	3	2	5
9	AM Radio Receiver Block diagram ,Main Specs Measurements of Main Specs	3	2	5
10	Angle Modulation Main concept of instantaneous frequency. BW of FM signal {Carson s Rule. Generation of FM signal {Direct and Indirect methods, Demodulation of FM signal}.Interference of Angle modulation. Pre-emphasis, and De-emphasis in FM Broadcasting FM Receiver. Measurements of Main Specs	6	4	10
11	Course Project & Technical Assignments	3	2	5
Total		45	30	75

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment #1	Communication Lab	Modulation and Coding Principles kit familiarization.
Experiment #2	Communication Lab	Amplitude Modulation waveform and spectrum demo.
Experiment #3	Communication Lab	AM (DSB-FC) generation and demodulation (coherent and non-coherent).
Experiment #4	Communication Lab	Calculating modulation index (μ) from waveform and spectrum.
Experiment #5	Communication Lab	MW radio: transmitter and receiver demo and signal tracing.
Experiment #6	Communication Lab	Measuring both image rejection and IF rejection of MW radio receiver.

6- Learning/Teaching Methods:

- Interactive Lecturing and Discussions.
- Problem Solving.
- Experiential Learning.
- Site Visit.

- Project and Presentation.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes and Homework.............................10%
  - Assignments and Course Project............................15%
  - Lab test...5%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

"Modern Digital and Analog Communication System", Fourth Edition, by B.P.Lathi and Zhi Ding, Publisher: Oxford University Press, 2010.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- University Library.
- Communication Lab.

Course coordinator:	**Dr. Kamel Hassan**
Head of Department:	**Dr. Kamel Hassan**
Date:	**November 2017**

Appendix

Table (1): The course ILOs are mapped to the program ILOs.

		Program ILOs													
		A3	A12	A13	A14	B2	B7	B8	C1	C4	C11	D1	D6	D7	D9
		Basics of information and communication technology.	Theories, techniques, analysis of analog and digital signals processing.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Basic concepts of data transmission and data computer networks.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth	Analyze and design communication systems based on the knowledge acquired.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory	Use the standard and appropriate tools to troubleshoot, maintain and repair the electronic systems.	Collaborate effectively within multidisciplinary team.	Effectively manage tasks, time, and resources.	Search for information and engage in life-long self-learning discipline.	Refer to relevant literatures.
	a1.														
Course ILOs	a2.														
	a3.														
	a4.														
	a5.														
	b1.														
	b2.														
	b3.														
	b4.														
	b5.														
	c1.														
	c2.														
	c3.														
	c4.														
	d1.														
	d2.														
	d3.														
	d4.														

Table (2): The course contents are mapped to the course ILOs.

	Course ILOs																	
	Knowledge and understanding					Intellectual Skills					Professional and practical skills				General and transferable skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
1. Communication History, basic definitions, Elements of comm. systems	■	■																
2. Contaminations: 1.Attenuation{guided &Unguided Channels}2.Distortion,3Interference &4.Noise.		■	■			■	■				■							
3. Shannon and Hartly Theorem Noise sources{Internal &External}.Linear Distortion		■	■				■						■					
4. Linear Distortion: Distortion-less Transmission, Equalization, Multipath effect., Fading. Non linear distortion		■	■				■	■				■						
5. Energy Spectral Density{ESD},Power spectral Density{PSD}								■					■					
6. Amplitude Modulation. DSB-SC, generation methods, basic Equations, Detection ,methods., DSB-FC, generation and detection Basic equations and measurements.				■					■			■						
7. SSB-SC. Basic Equations, Heilbert Transform Generation: Filtering method, NL modulator, and phasing method. DSB-FC				■					■									
8. AM Radio Transmitters/Receivers (Block diagram, Main Specs)			■		■				■				■					
9. FM Radio Transmitters/Receivers (Block diagram, Main Specs)			■		■				■				■					
10.Measurements of Main Specs													■	■	■	■	■	■
Course Project & Assignments													■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge and understanding					Intellectual Skills					Professional and practical skills				General and transferable skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecture																		
Discussion																		
Problem Solving																		
Experimental Learning																		
Cooperative Learning																		
Research																		
Site Visit (Field Trip)																		
Project																		

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Assessment Method	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Written Exams																		
Reports and Discussion																		
Lab work and Project																		
Relative weight %	30 %				50 %					15%					5 %			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 412: Communications 2

Programme(s) on which the course is given: B.Sc. in Electronic & Communication Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic level/ semester: 4^{th} level – 8^{th} semester
Date of specification approval: November 2017

A- Basic Information

Title: Communications 2 **Code: COM 412**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: COM 411: Communications 1

B- Professional Information

1- Catalogue Course Description:

Overview of Analog communication systems. Introduction to Digital communication. Analog to Digital Convertors. Sampling Theorem. Practical Aspects .Aliasing error. Information Rate and Bandwidth .Pulse modulation PAM, PWM, and PPM. Features, generation and detection. Pulse Code Modulation (PCM). Sampling, Quantization and Encoding. SNR_o. Companding Process, TDM: principles, framing bits, total bit rate R_b .T1 carrier system. Synchronization and signaling. Plesichronous Digital Hierarchy. Differential Pulse Code Modulation (DPCM).ADPCM, and DM. Line Codes: Properties, types, PSDs, and comparison, Pulse Shaping; ISI, Nyquist s First Criterion. Digital Receivers, and Regenerative repeaters. Equalizers, Time Extraction Detection Error. Error probability for different signals. Eye Diagram Digital Carrier Systems. M-ary Digital Modulation. Comparison of digital modulation schemes.

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

- Recognize the basic concepts of digital communication.
- Execute the necessary calculations of different A/Ds convertors.
- Explain the fundamentals of TDM multiplexing technique and the associated synchronisation methods.

- Analyze the line codes (waveforms).
- Estimate the error probability in threshold detection.
- Perform a comparison of Digital Carrier systems.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

a1. Explain the basic features of communication (analog & digital).
a2. Describe A/D techniques and the line coders.
a3. Explain knowledge and understanding of asynchronous and synchronous systems as well as ISI, pulse shaping and equalizers.
a4. Classify digital carrier systems as well as M-ary signalling.

b- Intellectual skills:

b1. Analyze of a digital communication system.
b2. Quantify the Nyquist sampling rate for different signals and perform the basic calculations for TDM system.
b3. Examine the transmission BW and the Output SNR for a binary PCM ,and DM signals
b4. Compare the different line codes and calculate its basic parameters.
b5. Estimate the BER for different digital carrier systems and design an appropriate equalizer.

c- Professional and practical skills:

c1. Design a simple digital communication system.
c2. Provide the appropriate digital carrier system for a certain application.
c3. Design a TDM system.
c4. Build-up the appropriate scheme to investigate the system performance.
c5. Develop software programs to analyze and to design a digital communication system.

d- General and transferable skills:

d1. Demonstrate a self-directed manner.
d2. Show the ability to work coherently and successfully as a part of a team..
d3. Manage time and meet deadlines.
d4. Analyze problems and use innovative thinking in their solution.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Overview of Analog communication systems. Introduction to Digital communication.	3	2	5
2	Analog to Digital Convertors, Sampling Theorem. Practical Aspects, Aliasing error, Information Rate, and Bandwidth.	3	2	5
3	Pulse Modulation: PAM, PWM, and PPM. Features ,generation and detection	3	2	5
4	Pulse Code Modulation {PCM}. Sampling, Quantization and Encoding. SNR_o. Companding Process	6.	4	10
5	TDM: principles, framing bits, total bit rate R_b .T_1 carrier system. Synchronization and signaling.	3	2	5

	Plesichronous Digital Hierarchy.			
6	Differential Pulse Code Modulation {DPCM}. ADPCM, and DM.	6	4	10
7	Line Codes: Properties, types, PSDs, and comparison.	3	2	5
8	Pulse Shaping; ISI, Nyquist s First Criterion. Digital Receivers and Regenerative repeaters. Equalizers, Time Extraction.	6	4	10
9	Detection Error. Error probability for different signals. Eye Diagram	3	2	5
10	Digital Carrier Systems. M-ary Digital Modulation	6	4	10
11	Course Project & Technical Assignments	3	2	5
Total		45	30	75

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment #1	Communication Lab	Sampling and TDM.
Experiment #2	Communication Lab	Digital Modulation forms 1 (ASK, FSK, PSK).
Experiment #3	Communication Lab	Digital Modulation forms 2 (QAM).
Experiment #4	Communication Lab	PCM.
Experiment #5	Communication Lab	Line Coding.

6- Learning/Teaching Methods:

- Interactive Lecturing and Discussions.
- Problem Solving.
- Experiential Learning.
- Site Visit.
- Project and Presentations

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes and Homework..10%
  - Assignments and Course Project..15%
  - Lab test..5%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1. B. Sklar, *Digital Communications: Fundamentals and Applications*. 2nd Ed., Upper Saddle River, NJ: Prentice Hall, 2006.
2. B. P. Lathi, Z. Ding, *Modern Digital and Analog Communication Systems* 4ed, Oxford University Press, 2011.
3. Periodicals, Websites, … etc

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- University Library.
- Communication Lab.

Course coordinator:	**Dr. Kamel Hassan**
Head of Department:	**Dr. Kamel Hassan**
Date:	**November 2017**

Appendix

Table (1): The course ILOs are mapped to the program ILOs

.

		Program ILOs													
		A3	A12	A13	A14	B2	B7	B8	C1	C4	C11	D1	D6	D7	D9
		Basics of information and communication technology.	Theories, techniques, analysis of analog and digital signals processing.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Basic concepts of data transmission and data computer networks.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth	Analyze and design communication systems based on the knowledge acquired.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory	Use the standard and appropriate tools to troubleshoot, maintain and repair the electronic systems.	Collaborate effectively within multidisciplinary team.	Effectively manage tasks, time, and resources.	Search for information and engage in life-long self-learning discipline.	Refer to relevant literatures.
Course ILOs	a1.														
	a2.														
	a3.														
	a4.														
	b1.														
	b2.														
	b3.														
	b4.														
	b5.														
	c1.														
	c2.														
	c3.														
	c4.														
	c5.														
	d1.														
	d2.														
	d3.														
	d4.														

Table (2): The course contents are mapped to the course ILOs.

	Knowledge and understanding				Intellectual Skills					Professional and practical skills					General and transferable skills			
Topic	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
1.Overview of Analog communication systems. Introduction to Digital communication.	■																	
2.Analog to Digital Convertors, Sampling Theorem. Practical Aspects, Aliasing error, Information Rate, and Bandwidth.		■				■				■								
3.Pulse Modulation: PAM, PWM, and PPM. Features, generation and detection		■			■													
4.Pulse Code Modulation {PCM}. Sampling, Quantization and Encoding. SNR_o. Companding Process		■					■											
5.TDM: principles, framing bits, total bit rate R_b .T_1 carrier system. Synchronization and signaling. Plesichronous Digital Hierarchy.		■				■						■						
6.Differential Pulse Code Modulation {DPCM}. ADPCM, and DM.		■					■					■						
7.Line Codes: Properties, types, PSDs, and comparison.		■						■			■							
8.Pulse Shaping; ISI, Nyquist s First Criterion. Digital Receivers and Regenerative repeaters. Equalizers , Time Extraction.			■						■									
9.Detection Error. Error probability for different signals. Eye Diagram				■					■									
10. Digital Carrier				■					■		■							

	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Systems. M-ary Digital Modulation				■					■		■							
11. Course Project & Technical Assignments													■		■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge and understanding				Intellectual Skills					Professional and practical skills					General and transferable skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■	■	■	■									
Discussion	■	■	■	■	■	■	■	■	■									
Problem Solving					■	■	■	■	■									
Experimental Learning										■	■	■	■	■				
Cooperative Learning										■	■	■	■	■	■	■	■	■
Research					■	■	■	■	■						■	■	■	■
Site Visit (Field Trip)	■	■	■	■														
Project										■	■	■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Assessment Method	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■									
Reports and Discussion					■	■	■	■	■						■	■	■	■
Lab work and Project										■	■	■	■	■	■	■	■	■
Relative weight %	30 %				50 %					15%					5 %			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 413: Electromagnetic Waves 2

Program (s) on which the course is given:	B.Sc. in Electronics & Communication Engineering.
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	4^{th} level – 7th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electromagnetic Waves 2 **Code: COM 413**

Credit Hours: **3 Cr. Hrs.**
Lecture: **3 Hrs. /week**
Tutorial/Lab: **2 Hrs. /week**
Total: **5 Hrs. /week**
Prerequisite: **COM 213 Electromagnetic Waves** 1

B- Professional Information

1- Catalogue Course Description:

The course aims to provide a coverage of the boundary conditions and the Transmission Lines T.L equivalent circuit. Lumped and distributed elements circuits. The distributed parameters of the Transmission line, Lumped – element model of a section of the TL .TEM T.L. Partial Differential equations for the wave propagation on a lossy and lossless T.L. Characteristics of a two conductors T.L.: Propagation Constant, attenuation constant, the characteristic impedance. Wave reflection and transmission at discontinuities. Voltage Standing Wave Ratio (VSWR), Input impedance for a Transmission Line loaded with an impedance Z_L .The Smith Chart. Applications on Smith Chart. Single stub line matching on Smith Chart. The Wave equation derived from Maxwell's equations for time harmonic fields.Plane Waves in free space. Wave velocity. Wave number and Wave length. The Wave equation in a general lossy and lossless media with parameters (ε, μ, σ) .The Waves in a conducting, semiconducting, and in dielectric media. Polarization of electromagnetic waves. The reflection coefficient of a Horizontal polarized wave. The reflection coefficient of a Vertical polarized wave. Brewster angle for the vertical polarized waves. Atmospheric refraction of electromagnetic waves. Standard parameters of the troposphere. The refractive index. Types of atmospheric refractions. The ionospheric layers. The safety levels during exposure to electromagnetic fields.

2- Overall Aims of the Course:

The overall aims of the course are:

1- Enrich students' knowledge of the transmission line analysis.
2- Develop students' skills wave transmission, reflection and refraction.
3- Increase students' background knowledge of the protection and electromagnetic wave safety levels.

3- Intended Learning Outcomes (ILOs) of the course:

By the end of this course the student should be able to:

a- Knowledge and Understanding:

a1. Estimate the input impedance, the reflection coefficient, and Voltage Standing Wave Ratio on the transmission line with a given load impedance.
a2. Discuss the matching problem using Smith chart and analytical methods.
a3. Estimate the reflection coefficients for the horizontal and vertical polarized waves.
a4. Recognize the different types of tropospheric refraction, the main characteristics of the ionosphere, and the different ionospheric layers.
a5. Recognize the safety protection levels of exposure to electromagnetic waves.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Analyze the characteristics of distributed circuit, and Transmission Line Parameters.
b2. Evaluate the stub matching problems using Smith Chart and numerical methods.
b3. Analyze the electromagnetic wave propagation in different media.
b4. Evaluate the electromagnetic wave reflections, refraction problems, interact with the tropospheric and ionospheric problems.
b5. Apply the safety level values during exposure to electromagnetic fields.

c- Professional & Practical Skills

c1. Practice the guide wavelength measurements.
c2. Practice the VSWR and the reflection coefficient measurements.

d- General Skills

d1. Communicate effectively.
d2. Refer to relevant literatures.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Definition of Transmission Lines. Lumped and distributed elements circuits. The distributed parameters of the Transmission Lines Lumped and distributed elements.	3	2	5
2	Lumped – element model of a section of the TL . Partial Differential equations for the wave propagation on a lossy and lossless T.L. Characteristics of the T.L. : Propagation Constant , attenuation constant , the characteristic impedance. Problems on the propagation constant , attenuation constant, the characteristic impedance of the transmission line.	6	4	10
3	Wave reflection and transmission at discontinuities. Voltage Standing Wave Ratio (VSWR). Input impedance for a Transmission Line loaded with an impedance Z_L . Calculations of the reflection , transmission coefficients and (VSWR).	3	2	5
4	The Smith Chart. Applications on Smith Chart. Single stub line matching on Smith Chart. The Wave equation derived from Maxwell's equations for time harmonic field. Applications on	6	4	10

	Smith Chart. Input impedance and stub matching. Mid -Term 1			
5	The Wave equation derived from Maxwell's equations for time harmonic field. Applications on Smith Chart. Input impedance and stub matching. Mid -Term 1	3	2	5
6	Waves in free space. Wave velocity. Wave number and Wave length. Relations between wave parameters.	3	2	5
7	The Wave equation in a general medium with parameters (ε , μ , σ) .The Waves in a conducting , semiconducting , and in dielectric medii. Calculations on conducting , semiconducting , and in dielectric medii. Polarization of electromagnetic waves. The reflection coefficient of a Horizontal polarized wave.	9	6	15
8	Calculation of the reflection coefficient for the Horizontal polarized wave. The reflection coefficient of a Vertical polarized wave. Brewster angle for the vertical polarized waves. Calculation of the reflection coefficient and Brewster angle for the Vertical polarized wave. + Mid-Term 2.	3	2	5
9	Atmospheric refraction of electromagnetic waves. Standard parameters of the troposphere Standard and the true parameters of the troposphere. The refractive index.	3	2	5
10	Types of atmospheric refractions. Different types of atmospheric refractions. Characteristics of each one. Ionospheric layers. Characteristics and equivalent parameters of ionosphere. Electromagnetic waves, Health and Safety standards.	6	4	10
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

6- Laboratory experiments:

Experiment 1#:	Electromagnetics Lab	Measurements of the guide wavelength.
Experiment 2#:	Electromagnetics Lab	Measurements the VSWR and the reflection coefficient.

7- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

8- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and Performance 10%
  - Mid-Term Exams..................................50%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

9- List of references:

" Engineering Electromagnetics"
William H. Hayt , John N. Buck.,McGraw.Hill,8th edition, 2012.

10- Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator: **Prof. Dr. Lotfy Sakr**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1) Course ILOs/Program ILOs Matrix

		Program ILOs							
		A1	A15	A17	B1	B2	C6	D3	D9
		Basic Sciences including classical and solid state physics, mechanics and chemistry.	Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering.	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.	Think in a creative and innovative way in problem solving and design.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Perform practical measurements of the microwave, antenna, and communication links.	Communicate effectively.	Refer to relevant literatures.
Course ILOs	a1.								
	a2.								
	a3.								
	a4.								
	a5.								
	b1.								
	b2.								
	b3.								
	b4.								
	b5.								
	c1								
	c2								
	d1								
	d2								

Table (2): Course Contents/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills					Practical skills		General skills	
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	d1	d2
The distributed circuit parameters. Propagation of electromagnetic waves on T.L.	■					■								
Input impedance , reflection coefficient ,and Voltage Standing Wave Ratio VSWR. Smith Chart.		■				■								
Matching problem using Smith chart and analytical methods.Attenuation constant and the power loss on a T.L.			■			■								
The wave equation, the wave velocity, the wave number, and the wavelength. The reflection coefficients for the Horizontal and Vertical polarized waves.			■				■				■	■	■	■
The Brewster angle for vertical polarized wave . The standard parameters of the troposphere.				■			■							
Different types of tropospheric refraction. Characteristics of the ionosphere, the different ionospheric layers.				■				■	■					
Safety protection levels of exposure to electromagnetic waves.					■					■				

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills					Practical skills		General skills	
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■	■	■	■				
Discussion	■	■	■	■	■	■	■	■	■	■				
Problem Solving						■	■	■	■	■				
Experiential Learning											■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills					Practical skills		General Skills	
Assessment Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	d1	d2
Written Exams	■	■	■	■	■	■	■	■	■					
Tutorial and Discussions						■	■	■	■	■	■	■	■	■
Relative weights %	80%										20%			

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 414: Communication Systems

Program (s) on which the course is given: B.Sc. in Electrical Power Engineering
Major or minor element of programs: (Not Applicable)
Department offering the program: Electrical Engineering
Department offering the course: Electrical Engineering
Academic Level/Semester: 4^{th} level – 7^{th} semester
Date of specification approval: November 2017

A- Basic Information

Title: Communication Systems **Code: COM 414**

Credit Hours: **3 Cr. Hrs.**
Lecture: **3 Hrs. /week**
Tutorial/Lab: **2 Hrs. /week**
Total: **5 Hrs. /week**
Prerequisite: COM 362 Signal analysis & MATH 312 Probability and Statistics (Math 6)

B- Professional Information

1- Catalogue Course Description:

Communication Systems objective, block diagram, transmission media, and signal impairments. SNR, and channel bandwidth, Shannon's equation. Analog and digital messages. Amplitude modulation (conventional AM, SSB, DSB and VSB) and demodulation, Angle modulation and demodulation (PM and FM), Broadcast transmitters and receivers (AM and FM).Principles of digital data transmission: Digital communication system: Sampling Theorem, PCM, and DM techniques Regenerative repeaters. Optical fiber communication system (Main features, OPGW Cable System). Hybrid networks (Power and data networks).

2- Overall Aims of the Course:

- ✓ Develop the students' knowledge about the fundamentals of analog & digital communication and to be able to differentiate between them.
- ✓ Develop students' knowledge about basics of optical fiber communication systems.
- ✓ Introduce concepts of computer communication and networking to power system elements

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Illustrate communication systems and transmission media.
a2. Describe channel bandwidth and SNR.
a3. Recognize analog and digital modulation techniques
a4. Explain optical fiber communication system.
a5. Illustrate data communication principles

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Evaluate the channel capacity and its relation with SNR.
b2. Apply the theory of the amplitude and angle modulation to solve the analog transmission problems.
b3. Apply the digital transmission theories and techniques in the digital communication systems.
b4. Outline theories and techniques of optical fiber communication system.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Use laboratory equipment to analyze experiment on the analog modulation techniques.
c2. Use laboratory equipment to analyze experiment on the digital communication system.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within team.
d2. Work in stressful environment and within constraints.
d3. Communicate effectively
d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Review on signal analysis	3	2	5
2.	Communication system: objective, history ,block diagram, transmission media, and signal impairments	6	4	10
3	Introduction to noise and channel capacity	3	2	5
4	Introduction to analog communication system. Amplitude modulation and demodulation	6	4	10
5	Angle modulation and demodulation	6	4	10
6	Introduction to digital communication systems and A/D conversion	3	2	5
7	Signal formatting	3	2	5
8	Digital modulation techniques	3	2	5
9	Introduction to Optical fiber systems	6	2	5
10	Data Communication fundamentals	3	2	5
11	computer communication and networking to power system elements	3	2	5
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Communication Lab	AM modulation & demodulation including DSB and SSB.
Experiment#2	Communication Lab	Angle modulation & demodulation including FM and PM.
Experiment#3	Communication Lab	Digital modulation techniques including ASK, PSK, FSK

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semester work:
  - Assignments……………………………………………10%
  - In Class Quizzes 10%
  - Mid-Term Exams...................................30%
  - Performance …………….................................10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

Essential books (text books)

B. P. Lathi : "Modern analog and digital communication systems", 2011.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Laboratory.

Course coordinator:	Dr. Kamel Hassan	
Head of Department:	Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs						
		Basics of Information and Communication Technology (ICT), and communication systems.	Apply mathematics and physics knowledge to solve engineering problems.	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Collaborate effectively within multidisciplinary team	Work in stressful environment and within constraints.	Communicate effectively.	Effectively manage tasks, time, and resources.
		A03	B01	C03	D01	D02	D03	D04
Course ILOs	a1							
	a2							
	a3							
	a4							
	a5							
	b1							
	b2							
	b3							
	b4							
	c1							
	c2							
	d1							
	d2							
	d3							
	d4							

Table (2): Course Contents/Course ILOs Matrix

course Contents	Knowledge & Understanding					Intellectual Skills				Practical Skills		General Skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	d1	d2	d3	d4
Review on signal analysis	■														
Review on Fourier representations	■														
Introduction to noise and channel capacity		■				■									
Intro. to analog comm. system. Amp. modulation and demodulation			■				■			■		■	■	■	
Angle modulation and demodulation			■				■			■		■	■	■	
Intro. to digital comm. systems and A/D conversion				■				■			■	■	■	■	■
Signal formatting				■				■			■	■	■	■	■
Digital modulation techniques					■			■			■	■	■	■	■
Introduction to Optical fiber systems									■						

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs														
	Knowledge & Understanding					Intellectual Skills				Practical Skills		General Skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■	■	■	■	■						
Discussion	■	■	■	■	■	■	■	■	■					■	■
Problem Solving						■	■	■	■						
Experiential Learning										■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assesment Method	Course ILOs														
	Knowledge & Understanding					Intellectual Skills				Practical Skills		General Skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■						
Lab & Project										■	■	■	■	■	■
Weight %	80 %									20 %					

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 415: Microwave Engineering

Programme (s) on which the course is given: B.Sc. in Electronics & Communication
Major or minor element of program: (Not Applicable)
Department offering the program: Electrical Engineering
Department offering the course: Electrical Engineering
Academic year/Level: Level 4 – 8th Semester
Date of specification approval: November 2017

A- Basic Information

Title: Microwave Engineering **Code: COM 415**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisite: ELE 413 Electromagnetic Wave 2

B- Professional Information

1- Catalogue Course Description:

Equivalent circuit of waveguides: N-port circuit, circuit description, scattering parameters, excitation of wave guides, waveguides coupling by aperture, Passive devices: terminations, attenuators, phase shifters, directional couplers, Hybrid junctions, Circuit theory of resonators, Fabry Perot and optical resonators, Microwave measurements, detection and measurement of microwave power, measurement of wavelength, and measurement of impedance. Ferrites

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

- Enrich students' knowledge about the different field expressions.
- Prepare students to differentiate between different kinds of waveguides and cavity resonators.
- Train students to identify different types of microwave filters & micro-strip lines used in their design.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

a1. Describe different elements of microwave systems.
a2. Summarize design problems for waveguides cavity resonators and filters.

b- Intellectual skills:

b1. Develop ideas in structural and mathematical terms so that quantitative evaluation is facilitated.
b2. Create solutions for microwave networks
b3. Evaluate obtained results both individually or as a part of team.

c- Professional and practical skills:

c1. Application of microwave slotted line.
c2. Measurements of dielectric constants of different dielectric materials.

d- General and transferable skills:

d1. Work coherently and successfully as a part of a team in the Lab., projects, and assignments.
d2. Communicate Effectively.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Contents:

Topic	No. of Hours	Lecture	Tutorial/practical
Waveguides- planar	1 week (5 hrs./week) = 5 hrs.	3 hrs.	2 hrs.
Modes (TEM, TE, and TM) general field equations	1 week (5 hrs./week) = 5 hrs.	3 hrs.	2 hrs.
Rectangular Waveguide, Circular Waveguide (modes, power, attenuation 1st Midterm	3 weeks (5 hrs./ week) = 15 hrs.	9 hrs.	6 hrs.
Cavity resonators: resonance frequency- quality factor	3 weeks (5 hrs./week) = 15 hrs.	9 hrs.	6 hrs.
2nd Midterm Filters- insertion loss- maximally flat, equal ripple- LPF, HPF, BPF, and BSF	3 weeks (5 hrs./week) = 15 hrs.	9 hrs.	6 hrs.
Impedance – frequency scaling, and implementation	4 weeks (5 hrs./week) = 20 hrs.	12 hrs.	8 hrs.
TOTAL	75 hrs.	45 hrs.	30 hrs.

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- Lab Experiments:

Experiment 1#:	Electromagnetics Lab	Measurement of dielectric constant of dielectric material using slotted line

7- Learning/teaching methods:

See Appendix, table [3]

8- Student assessment methods:

Final exam:..40%
Semester work:
In Class Quizzes...10%
2 Midterms 30%
Performance/assignments...20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

Assessment schedule

Assessment 1	Quiz 1	Week 5
Assessment 2	First Mid-Term Exam	Week 6
Assessment 3	Project 1	Week 8
Assessment 4	Quiz 2	Week 9
Assessment 5	Second Mid-Term Exam	Week 10
Assessment 67	Final Exam	Week 16

9- List of references:

Essential books (text books)

D.M.Pozar," Microwave Engineering, John Wiley, 4th Edition, 1994

Recommended literature

R.E.Collin," Foundation for Microwave Engineering" Wiley, 2001

10- Facilities required for teaching and learning:

Lecture notes
White board
Data show for presentations

Course coordinator: Prof. Dr. Ibrahim A. Salem

Date: November 2017

APPENDIX

Table (1) Course ILO's/ Program ILO's Matrix

		Program ILOs						
		A15	B11	B13	C5	C6	D1	D3
		Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering.	Assess and evaluate the characteristics and performance of component, systems and processes	Analyze the performance of microwave and antenna systems.	Apply numerical modelling methods to microwave, antennas, electronic and communication systems.	Apply numerical modelling methods to microwave, antennas, electronic and communication systems.	Collaborate effectively within multidisciplinary team	communicate effectively
Course ILOs	a1							
	a2							
	b1							
	b2							
	b3							
	c1							
	c2							
	d1							
	d2							

Table (2): Course Topics/ Course ILO's

Topics	Knowledge & Understanding			Intellectual Skills		Professional & Practical skills		General Skills	
	a1	a2	b1	b2	b3	c1	c2	d1	d2
Planar waveguide									
Rectangular waveguides. Circular waveguides, different modes, calculation of power and attenuation									
Cavity resonators, rectangular and cylindrical cavities, field configuration, modes, calculation of resonance frequency and quality factor									
Filters; LPF, HPF, BPF, and BSF. Insertion loss method of design. Maximally flat and equal ripple filters, scaling and implementation									

Table (3): Learning/ Teaching Method/ Course ILO's

Learning/Teaching Method	Knowledge & understanding		Intellectual skills			Practical skills		General skills	
	a1	a2	b1	b2	b3	c1	c2	d1	d2
Interactive Lecturing									
Discussion									
Problem Solving									
Experiential Learning									

Table (4): Assessment Method/ Course ILO's

Assessment Method	Knowledge & understanding		Intellectual skills			Practical skills		General skills		
	a1	a2	b1	b2	b3	c1	c2	d1	d2	d3
Written exam										
Lab report and discussion										
Relative weight %	80 %					20 %				

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

Programme (s) on which the course is given: B.Sc. in Electronics & Communication Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic year/Level: 5th Level - 9th & 10th Semesters
Date of specification approval: November 2017

A- Basic Information

Title: Graduation Project **Code: COM 500**
Credit Hours: COM 500: 0 Cr. Hrs. & COM 501: 4 Cr.Hrs.
Lectures: COM 500: 2 Hrs. & COM 501: 0 Cr.Hrs.
Tutorial: COM 500: 2 Hrs. & COM 501: 4 Cr.Hrs.
Total: 4 Hrs
Prerequisite: COM 500: As advised & COM 501: COM 500

B- Professional Information

1- Catalogue Course Description

An engineering assignment requiring the student to demonstrate initiative and assume responsibility, The student will select a project at the end of the ninth semester, Students can propose their own project, A faculty member will provide supervision, A project report is required at the end of the tenth semester.

2- Overall aims of the course:

The overall aims of the course are:

- Develop the students' knowledge about the fundamentals and contemporary topics related to electronics & communication domain of the project.
- Train students to apply knowledge of mathematics, science, information technology, electronics and communication engineering knowledge and practices integrally to design and/or implement a process, component or system related to electronics & communication engineering.

- Enhance students' programming skills, software tools applications and/or practical capabilities appropriate to the project domain.
- Develop students' soft skills including writing and presentation skills; team work; lifelong learning skills; effectively managing tasks, resources and time; and interface to real life applications.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

a1- Demonstrate the knowledge, fundamentals, theories and/or practices gained during the study program and relevant to the project domain.

a2- Identify quality assurance systems, codes of practice and standards, health and safety requirements appropriate to the topic of the project.

a3- Demonstrate contemporary electronics & communication engineering topics related to the project domain.

a4- Describe design methods and tools for electronics & communication engineering equipment and systems relevant to the project domain.

b- Intellectual skills:

b1- Think in a creative and innovative way in problem solving and design.

b2- Analyze real-life problems.

b3- Use software package related to the topic.

b4- Combine, exchange, and assess different ideas and knowledge from range of sources for solving electronic and communication systems problems.

b5- Investigate the failure and develop innovative solution for electronic and communication systems, and processes.

c- Professional and practical skills:

c1- Professionally merge the knowledge of electronic and communication systems to improve design, products and services.

c2- Find and implement suitable solutions

c3- Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.

c4- Follow up safety requirements at work and observe the appropriate steps to manage risks

c5- Apply quality assurance and follow the appropriate codes and standards.

c6- Write, edit and present a technical report.

c7- Exchange knowledge and skills with communication systems engineering community and industry.

d- General and transferable skills:

d1- Collaborate effectively within multidisciplinary team.

d2- Work in stressful environment and within constraints.

d3- Communicate effectively.

d4- Demonstrate efficient IT capabilities.

d5- Lead and motivate individuals.

d6- Effectively manage tasks, time, and resources.

d7- Search for information and engage in life-long self-learning discipline.
d8- Acquire entrepreneurial skills.
d9- Refer to relevant literatures.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Contents:

Topic	No. of Hours
Project Selection and Specification	10 hrs.
Literature Review and Background Study	20 hrs.
Planning For The Project	10 hrs.
Analysis and Design	40 hrs.
Implementation	60 hrs.
Testing	20 hrs.
Debugging and Finalization	20 hrs.
Documentation	20 hrs.
Total	200* hrs.

** 1st semester: 15 weeks x 4 Hrs. /wk. = 60, 2nd semester: 15 weeks x 4 Hrs. /wk. = 60, 4 weeks after: 4 weeks x 5 days/wk. x 4 Hrs. /day = 80 Hrs. , total = 200 Hrs.*

6- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in table [3]

7- Student assessment methods:

- **Final exam: ……………………………………………50 %**
  - Project End-Product ……….……………........20 %
  - Project Report ……………………………10 %
  - Oral Presentation (Defense) …………….. 20 %
- **Semester work: ……………………………………….. 50 %**
  - Assignments …………………………….. 5 %
  - Participation and Discussion ……………. 25 %
  - Computer project ………………………... 10 %
  - monthly presentation ……………………. 10 %

8- List of references:

6.1- Course notes

No course notes are required

6.2- Essential books (text books)

According to each project

6.3- Recommended books

According to each project

9- Facilities required for teaching and learning:

7.1- Lecture Hall
7.2- White board
7.3- antenna laboratory

Course coordinator: **All staff**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: November 2017

Table [1]. Program ILOs vs Courses ILOs matrix

		Course ILOs																								
		a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	c6	c7	d1	d2	d3	d4	d5	d6	d7	d8	d9
Program ILOs	A7	■			■																					
	A8	■			■																					
	A10	■			■																					
	A12	■		■	■																					
	A13	■		■	■																					
	A14	■		■	■																					
	A15	■		■	■																					
	A16	■		■	■																					
	A17		■																							
	B1					■																				
	B3							■																		
	B7						■																			
	B8						■																			
	B9								■																	
	B10						■																			
	B11						■																			
	B12									■																
	B13						■																			
	B15						■																			
	C2										■															
	C3											■														
	C4												■													
	C7													■												
	C8														■											
	C9																■									
	C10															■										
	D1																	■								
	D2																		■							
	D3																			■						
	D4																				■					
	D5																					■				
	D6																						■			
	D7																							■		
	D8																								■	
	D9																									■

Table [2] Contents vs Course ILOS

	Knowledge & Understanding				Intellectual Skills					Professional Skills							General Skills								
Contents	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	c6	c7	d1	d2	d3	d4	d5	d6	d7	d8	d9
Project Selection and Specification	■																								
Literature Review and Background Study	■		■																						
Planning For The Project	■	■	■	■	■												■		■			■			
Analysis and Design	■	■	■	■	■	■	■	■	■								■	■	■	■			■		■
Implementation	■	■	■	■			■	■		■	■	■	■	■		■	■	■	■	■	■	■	■	■	■
Testing	■		■	■			■			■	■	■	■	■		■	■	■	■	■	■	■	■	■	■
Debugging and Finalization			■		■				■	■	■	■	■	■			■	■	■	■	■	■	■	■	■
Documentation															■		■		■	■				■	■

Table [3] Teaching Method vs Course ILOs

	Knowledge & Understanding				Intellectual Skills					Professional Skills							General Skills								
Teaching Methods	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	c6	c7	d1	d2	d3	d4	d5	d6	d7	d8	d9
Interactive Lecturing	■	■	■	■	■	■	■	■	■										■						
Discussion	■	■	■	■	■	■	■	■	■								■		■	■					■
Problem Solving					■	■	■	■	■																
Experiential Learning										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cooperative Learning																	■		■		■	■			
Research																									■
Field Visit																								■	
Case study																							■	■	■

Table [4] Assessment Method vs Course ILOs

	Knowledge & Understanding				Intellectual Skills					Professional Skills							General Skills								
Assessment Methods	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	c6	c7	d1	d2	d3	d4	d5	d6	d7	d8	d9
Assignment	■	■	■	■	■	■	■	■	■								■		■	■					■
Reports										■	■	■	■	■	■	■				■			■		■
Presentation																		■		■	■	■	■	■	■
Research	■	■	■	■	■	■	■	■	■																

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 520: Telecommunication Networks

Programme(s) on which the course is given:
Electronics and Communication Engineering

Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5th Level – 10th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Telecommunication Networks **Code: COM 520**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	COM 412: Communications 2

B- Professional Information

1- Catalog Course Description:

Introduction to telecommunications, Telegraph and telephone, Switching: telegraph, telephone, telex, data, signaling, ISDN, broad band, private switching. Network multiplexing: analog, digital, wavelength division, Data transmission interface equipment: modems, digital data interface equipment, Codecs: audio, video, Copper lines: open wire, twisted pair cable, coaxial cable, Optical fiber technology: types of optical fibers, cables, applications, Radio relay systems, Mobile radio: service mode technology, Satellites: services, technology, digital subscriber lines.

2- Overall aims of the course:

The Main Goals of this course are:

- Develop student knowledge about the fundamentals of telecommunication and its terminology.
- Prepare students to study and design pulse code modulation systems.
- Train students to evaluate the performance of teletraffic theory and models.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Explain the fundamentals of telecommunication networks and their terms.
a2. Interpret the principles of teletraffic theory and its fundamental models.
a3. Demonstrate the applications of teletraffic models in network design and analysis.

b- Intellectual skills:

By the end of this course the student should be able to:

b1. Design and analyze the performance of telecommunication networks, e.g. pulse code modulation.
b2. Apply teletraffic theory for modelling basic telecommunication networks.
b3. Design using software tools the parameters of teleraffic networks and evaluate their performance.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	Introductory Topics	6	4	10
2	Transmission and Modulation	6	4	10
3	Digital Networks and Pulse Code Modulation	9	6	15
4	Line Coding and Regenerative Repeaters	9	6	15
5	Fundamentals of Teletraffic Theory	6	4	10
6	Some Basic Teletraffic Models	9	6	15
Total		**45**	**30**	**75**

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes..10%
  - Performance/Attendance..20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book:
   Roger L. Freeman, *Fundamentals of Telecommunications*, John Wiley & Sons, Inc., 1999.
2. Recommended Readings:
   Waleed Al-Hanafy, MSc. thesis: "Teletraffic Analysis of the Next-Generation Integrated Terrestrial/Satellite Mobile Radio Networks, http://waleedeid.tripod.com/my_master_thesis.pdf, 2002.

Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator: **Dr. Waleed Al-Hanafy**
Head of Department: **Dr. Kamel Mohamed Hassan**
Date: **November - 2017**

Appendix

Table (1): Course ILOs/Program ILOs Matrix

		Program ILOs					
		A3	A13	A14	B1	B3	B8
		Basics of information and communication technology	Theories, techniques, and technology in the field of communication links including satellite, optical fibres, and mobile communication systems.	Basic concepts of data transmission and data computer networks.	Think in a creative and innovative way in problem solving and design.	Use software tools to develop computer programs for engineering applications.	Analyze and design communication systems based on the knowledge acquired.
Course ILOs	a1	■	■	■			
	a2	■	■	■			
	a3	■	■	■	■		■
	b1				■		■
	b2				■		■
	b3					■	

Table (2): Course Contents/Course ILOs

Topic	a1	a2	a3	b1	b2	b3
Introductory Topics	■					
Transmission and Modulation	■			■		
Digital Networks and Pulse Code Modulation	■			■		
Line Coding and Regenerative Repeaters	■			■		
Fundamentals of Teletraffic Theory		■	■	■	■	
Some Basic Teletraffic Models		■	■	■	■	■

Table (3): Teaching Methods/Course ILOs Matrix

Topic	a1	a2	a3	b1	b2	b3
Interactive Lecturing	■	■	■	■	■	
Problem Solving			■	■	■	■
Discussion	■	■	■	■	■	

Table (4): Assessment Methods/Course ILOs Matrix

Topic	a1	a2	a3	b1	b2	b3
Assignments						
Midterm & Final Exam						
Overall Percentage	20%	20%	20%	20%	10%	10%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

Program (s) on which the course is given: B.Sc. in Electronics & Communication Engineering)
Major or minor element of programs: (Not Applicable)
Department offering the program: Electrical Engineering
Department offering the course: Electrical Engineering
Academic year/Level: Level 5- 10^{th} Semester
Date of specification approval: November 2017

A-Basic Information

Title: Antennas And Propagation **Code: COM 521**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisite: COM 415 (Microwave Engineering)

B-Professional Information

1- Catalog Course Description

The course of antenna includes the study, analysis, and design of:
Antenna types and antenna parameters, Wire antennas: small wire antenna, dipoles, monopole, folded – loop antenna, helical antennas (normal, and axial)- travelling wave antenna (including rhombic antennas). Arrays: broadside- binomial- Chybeshev, end fire array, and phased arrays. Aperture antennas: open end waveguides (rectangular, and circular apertures). Horns: sectoral, pyramidal, and conical horns. Reflectors: single, double and corner reflectors. Lens antennas: dielectric and parallel plates. Wide band antennas (spiral- LPDA). Microstrip antennas.

2- Overall aims of the course:

The overall aims of the course are:
1- Enrich students' knowledge of the Antenna theory, Types, Analysis and Design.
2- Develop students’ skills in the design of dipoles, Horns, reflector antennas.
3- Enrich students’ knowledge about the different Satellite antennas.

3- Intended Learning Outcomes of Course (ILOs):

Upon successful completion of the course, the student should be able to:

a- Knowledge and understanding:

a1. Explain the fundamental antenna terms and parameters, field patterns, Polarization Loss Factor (PLF), the antenna efficiency, and the antenna gain.

a2. Recognize the radiation characteristics of the dipole antennas, and the aperture antennas.

a3. Estimate of the different horn types, and determination of the geometrical parameters, the Power Budget, and (C/N_o) ratio for a communication Channel.

a4. Recognize the parabolic reflector antenna, the cassegrain system and the applications for the different antenna types.

a5. Explain the construction and functions of the control ground stations (GCS) for Satellite control.

b- Intellectual skills:

b1. Apply the different techniques to the design of the different antenna systems calculations.

b2. Analyze the performance of different antenna systems.

c- Professional & Practical skills:

c1. Measure the antenna field pattern, to determine HPBW, FNBW and SLL.

c2. Measure of the antenna VSWR.

d- Professional & Practical skills:

d1. Work in stressful environment and within constraints.

d2. Communicate effectively.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Contents:

Topic	No. of Hours	Lecture	Tutorial/ practical
Introduction to antenna definition and types. Fundamental antenna parameters.	1 week (5 hrs./week) = 5 hrs.	3 hr.	2 hr.
Field regions, radiation power density and intensity. Directive gain, directivity, efficiency and gain.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
HPBW, FNBW, polarization of the wave and of the antenna. Polarization types, the polarization loss factor (PLF).	2 week (5hrs./week) = 10 hrs.	6 hr.	4 hr.
Friis transmission equation, Link budget calculations. Infinitismal dipole , radiation fields and radiation resistance. + Mid-Term Exam 1.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Finite length dipole, Half wave dipole. Radiation patterns and radiation resistance. Input impedance.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Aperture antennas, rectangular aperture , Circular aperture. Radiation patterns, antenna characteristics , For different aperture field distributions. Electromagnetic horns. E-Sectoral Horn, H- Sectoral Horn . Pyramidal Horn. Conical Horn. Corrugated Horns. + Mid-Term Exam 2.	4 week (5 hrs./week) = 20 hrs.	12hr.	8hr.
Antenna Systems. Parabolic , Cassegrain, and Gregorian systems. GCS stations for Satellites.	2 week (5 hrs./week) =10 hrs.	6 hr.	4 hr.
TOTAL	75 hrs.	45 hrs.	30 hrs.

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- Lab Experiments:

Experiment 1#:	Electromagnetics Lab	Measurement of the antenna field pattern and determine the HPBW, FNBW, SLL.
Experiment 2#:	Electromagnetics Lab	Measurement of the antenna VSWR

7- Teaching and learning methods:

See Appendix, table [3]

8- Student Assessment Methods:

Final exam:..40%
Semester work:
In Class Quizzes..10%
2 Midterms 30%
Performance/assignments..20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

Assessment schedule

Assessment 1	First Mid-Term Exam	Week 6
Assessment 2	Second Mid-Term Exam	Week 10
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 14

9- List of references:

Essential books (text books):

" Antenna Theory Analysis and Design", Constantine A. Balanis., West Verginia University, Harper & Row Publishers, N.Y, 2012.

10- Facilities required for teaching and learning:

1- Lecture Hall
2- White board
3- Data show for presentations

Course coordinator: **Prof. Dr. Lotfy Sakr**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: November 2017

Appendix

Table (1) Course ILOs/Program ILOs Matrix

		Program ILOs							
		A13	A15	B2	B13	C6	C7	D2	D3
		Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Analyze the performance of microwave and antenna systems.	Perform practical measurements of the microwave, antenna, and communication links.	Follow up safety requirements at work and observe the appropriate steps to manage risks.	Work in stressful environment and within constraints.	Communicate effectively.
Course ILOs	a1								
	a2								
	a3								
	a4								
	a5								
	b1								
	b2								
	c1								
	c2								
	d2								
	d3								

Table (2): Course Contents/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills		Professional & Practical skills		General Skills	
Topic	a1	a2	a3	a4	a5	b1	b2	c1	c2	d1	d2
Introduction to antenna definition and types. Fundamental antenna parameters.											
Field regions ,radiation power density and intensity. Directive gain , directivity, efficiency and gain.											
HPBW, FNBW, polarization of the wave and of the antenna. Polarization types , the polarization loss factor (PLF).											
Friis transmission equation , Link budget calculations. Infinitismal dipole , radiation fields and radiation resistance.+ Mid-Term Exam 1.											
Finite length dipole, Half wave dipole. Radiation patterns and radiation resistance. Input impedance.											
Aperture antennas, rectangular aperture, Circular aperture. Radiation patterns, antenna characteristics, For different aperture field distributions. Electromagnetic horns+ Mid-Term Exam 2.											
Antenna Systems. Parabolic , Cassegrain, and Gregorian systems. GCS stations for Satellites.											

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills		Professional & Practical skills		General skills	
Teaching Method	a1	a2	a3	a4	a5	b1	b2	c1	c2	d1	d2
Interactive Lecturing											
Discussion											
Problem Solving											
Experiential Learning											

Table (4): Assessment Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills		Professional & Practical skills		General skills	
Assessment	a1	a2	a3	a4	a5	b1	b2	c1	c2	d1	d2
Written Exams											
Performance/ assignment											
Relative weights %	80 %					20 %					

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications
COM 522: Optical Networks

Programme(s) on which the course is given: Electronics and Communication Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic level/ semester: Level Five– 2nd semester
Date of specifications approval: November, 2017

A- Basic Information

Title: Optical Networks **Code: COM 522**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: **COM 412+COM 527**

Topics:
1. Introduction to Optical Networks
2. Building blocks of Optical Networks
3. Optical Networks: Technology, Topology, Control and Management

:Text Book R. Ramaswami, K. N. Sivarajan, G. H. Sasaki, Optical Networks: a Practical Perspective, 3-rd ed., Morgan Kaufmann 2010.

B- Professional Information

1- Catalogue Course Description:
Introduction to optical networks, propagation of signals in optical fiber as well as transmission characteristics of optical fibers, basic building blocks (couplers, multiplexers , filters, optical amplifiers, transmitters, detectors, switches, and wavelength converters), Modulation and demodulation, transmission system engineering, Client layers of optical layer, WDM network elements and design, Control and management, Photonic packet switching, Design example.

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

a . Develop a critical understanding of the current stage of optical communication networks including some recent trends in research and development of new concepts in optical communication.

b. .Be aware of the propagation mechanisms of optical signals over optical fibers and the transmission characteristics of the optical fibers.

c.. Estimate the power and rise time budgets for an optical link.

d.. Understand the structure, function and the principles of operation of the main blocks comprising the optical network.

e. Estimate the optical network performance

Intended learning outcomes of course (ILOs):

At the end of the course, student will be able to:

.

a- Knowledge and understanding:

a1. Demonstrate knowledge and understanding of the basic features of communication networks.
a2. Demonstrate knowledge and understanding of optical fibers communication
a3. Demonstrate knowledge and understanding of basic blocks {Optical filter, optical amplifier, couplers, switches, isolators, wavelength converters…,and etc)
a4. Demonstrate knowledge and understanding of network security.

b- Intellectual skills:

b.1 Analyze physical parameters of optoelectronic components and judge if a given set of components can be used in a network.

b.2 Analyze physical layer of an optical network and find the bottleneck limiting the information capacity.

b.3. Estimate the power budget and rise time budget

b.4 .Analyse of an optical communication network

c- Professional and practical skills:

.c1. Design an optical link and simple optical networks.
. c2. Able to choose the appropriate network configuration and to choose the main basic blocks.
c.3. Set-up the appropriate scheme to investigate the system performance.
c.4. Use software programs to analyze and design of an optical comm. network.

d- General and transferable skills:

d1. Work in a self-directed manner
d2. Work coherently and successfully as a part of a team in the Lab., projects, and assignments.
d3. Manage time and meet deadlines.
d4. Analyze problems and use innovative thinking in their solution.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

3- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Review of optical fiber communication	3	2	5
2	Introduction to optical communication networks	3	2	5
3	Structure, function, and specifications of the main optical and opto- electronic components used in optical networks{couplers, multiplexers, filters, optical amplifiers transmitters, detectors, switches, and wavelength convertors}	9	6	15
4	Modulation and demodulation	3	2	5
5	Transmission system engineering	3	2	5
6	Client layers of optical layer	3	2	5
7	WDM network elements and design	6	4	10
8	.Control and management	6.	4	10
9	Photonic packet switching	3	2	5
10	Design Example	6	4	10
Total		45	30	75

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work:

none

5- Learning/Teaching Methods:

6.1- Lectures.
6.2- Tutorials.
6.3- Research assignments
.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam: 40%
- Semester work:
  - Mid-Term exams 30%
  - In Class Quizzes and Homework 10%
  - Assignments and Course Project 15%
  - Lab test 5%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

1.Optical Communication Network by: Biswanath Mukherjee
McGraw-Hill, Jan 1, 1997.

2. OPTICAL COMMUNICATION AND NETWORKS by : M. N. BANDYOPADHYAY
PHI Learning, Feb 11, 2014

8. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- University Library.
- Communication Lab.

Course coordinator:	**Dr. Kamel Hassan**
Head of Department:	**Dr. Kamel Hassan**
Date:	**Novembery, 2017**

Appendix

Table (1): The course ILOs are mapped to the program ILOs.

Course ILOs	A9 Principles and applications of secure communication.	A13 Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	A14 Basic concepts of data transmission and data computer networks.	B7 Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth	B8 Analyze and design communication systems based on the knowledge acquired.	C2 Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and	C3 Design a process , component or system and practice the quality of electronic and communication systems	C4 Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory	D1 Collaborate effectively within multidisciplinary team.	D2 Work in stressful environment and within constraints.	D5 Lead and motivate individuals.	D6 Effectively manage tasks, time, and resources.
a1.			X									
a2.		X										
a3.		X										
a4.	X											
b1.					X							
b2.				X								
b3.				X								
b4.					X							
c1.							X					
c2.						X						
c3.								X				
c4.								X				
d1.										X		
d2.									X			
d3.												X
d4.											X	

Table (2): The course contents are mapped to the course ILOs.

Topic	knowledge and understanding				Intellectual Skills				practical skills				General skills			
	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
1. Review of optical fiber communication																
2. Introduction to optical communication networks																
3. Structure, function, and specifications of the main components used in optical networks{couplers, multiplexers, filters, optical amplifiers transmitters, detectors, switches, and wavelength convertors}																
4. Modulation and demodulation																
5. Transmission system engineering																
6. Client layers of optical layer																
7. WDM network elements and design																
8. Control and management																
9. Photonic packet switching																
10. Design Example																

Table (3): The teaching method are mapped to the course ILOs.

Learning/Teaching Method	knowledge & understanding				Intellectual Skills					practical skills					General skills			
	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Lectures																		
Tutorials																		
Research assignments																		
Lab work and project																		
Analysis and Implementation of a specified project																		

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs																	
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Written Exams																		
Reports and Discussion																		
Project																		
Relative weight %	40 %				40 %					15%					5 %			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 523: Mobile Communication Systems

Programme(s) on which the course is given:
Electronics & Communication Engineering

Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5^{th} Level – 10^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Mobile Communication Systems **Code: COM 523**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	**COM 412: Communications 2**

B- Professional Information

1- Catalog Course Description:

Conventional telephone systems, Traffic theory, Conventional mobile system, Frequency spectral efficiency, Methods of increasing system capacity, System, Architecture, Access schemes, Interference in cellular system, Hand off, propagation models, Fading and Doppler in cellular system, GSM system architecture, GSM channel coding, Ciphering and modulation, System management, CDMA spread spectrum systems, Direct sequence SSS, The performance of DS-SSS, CDMA air links: the forward pilot channel, sync channel, paging channel, traffic channel, Access channel, Types of codes used in CDMA, Power and Hand-off.

2- Overall aims of the course:

The Main Goals of this course are:

- Develop student knowledge about the fundamentals of mobile communication systems and their evolution.
- Prepare students to design mobile communication networks.
- Train students to evaluate the performance of mobile communication systems.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Explain the fundamentals of mobile communication systems and their terms.
- a2. Interpret the principles of teletraffic theory and its application in mobile network design.
- a3. Describe the principles of mobile network design and analysis.

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Design and analyze the performance of mobile radio networks.
- b2. Apply tele-traffic theory for modelling mobile radio networks.
- b3. Use software tools in programing the parameters of tele-traffic theory and evaluate the performance.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	The Cellular Concept and its Fundamentals	9	6	15
2	Interference and System Capacity	6	4	10
3	Trunking and Grade of Service	6	4	10
4	Improving Capacity in Cellular Systems	6	4	10
5	Large-Scale Path Loss	9	6	15
6	Small-Scale Fading and Multipath	6	4	10
7	Time Dispersion and Coherence Bandwidth	3	2	5
	Total	**45**	**30**	**75**

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes..10%
  - Performance/Attendance..20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book:
   Theodore S. Rappaport, *Wireless Communications Principles and Practice*, 2nd ed. Prentice Hall, 2002.
2. Recommended Readings:
   a) A. Goldsmith, *Wireless Communications*, Cambridge University Press, 2005.

Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator:	**Dr. Waleed Al-Hanafy**
Head of Department:	**Dr. Kamel Mohamed Hassan**
Date:	**November - 2017**

Appendix

Table (1): Course ILOs/Program ILOs Matrix

		Program ILOs				
		A13	A14	B1	B3	B8
		Theories, techniques, and technology in the field of communication links including satellite, optical fibres, and mobile communication systems.	Basic concepts of data transmission and data computer networks.	Think in a creative and innovative way in problem solving and design.	Use software tools to develop computer programs for engineering applications.	Analyze and design communication systems based on the knowledge acquired.
Course ILOs	a1					
	a2					
	a3					
	b1					
	b2					
	b3					

Table (2): Course Contents/Course ILOs

	Knowledge & Understandings			Intellectual Skills		
Topic	a1	a2	a3	b1	b2	b3
The Cellular Concept and its Fundamentals						
Interference and System Capacity						
Trunking and Grade of Service						
Improving Capacity in Cellular Systems						
Large-Scale Path Loss						
Small-Scale Fading and Multipath						
Time Dispersion and Coherence Bandwidth						

Table (3): Teaching Methods/Course ILOs Matrix

	Knowledge & Understandings			Intellectual Skills		
Topic	a1	a2	a3	b1	b2	b3
Lecture						
Discussion						
Problem Solving						
Computer Work						

Table (4): Assessment Methods/Course ILOs Matrix

Topic	a1	a2	a3	b1	b2	b3
Assignments						
Midterm & Final Exam						
Overall Percentage	20%	20%	20%	20%	10%	10%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 524: Satellite Communication Systems

Program (s) on which the course is given: B.Sc. in Electronics & Communication Engineering
Major or minor element of programs: (Not Applicable)
Department offering the program: Electrical Engineering
Department offering the course: Electrical Engineering
Academic Level: 5th Level – 10th semester
Date of specification approval: November 2017

A-Basic Information

Title: Satellite Communication Systems **Code: COM 524**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisite: COM 412 Communication 2

B-Professional Information

1- Catalog Course Description

Satellite Orbits. Orbital Parameters and terms. General satellite orbit. LEOs , MEOs, GEO Satellite orbits. Keplerian set of orbital parameters. Orbit perturbations. Sun synchronous orbits. Geostationary orbit. Characteristics of Satellite communication. Uplinks ,Downlinks and onboard system. Power Budget calculations. Satellite EIRP , G/T ratio. Carrier To Noise ratio (C/N), Carrier To Noise Spectral Density ratio C/N_0, Useful bitrate. Satellite Construction. Satellite subsystems: Payload (P/L), Electrical Power (EPS), Telemetry and Telecommand (TCR), Attitude Determination and Control (ADCS) subsystems. Construction of the P/L subsystem. Input Demultiplexer (IMUX) , Transponder , Travelling Wave Tube (TWT) as HPA, Channel Amplifiers (CAMPS), Output Multiplexer (OMUX). (P/L) receiving and transmitting antennas. Gregorian , Cassegrain and Parabolic Reflector antennas. Multiple access techniques. Methods of transmissions. MCPC and SCPC transmissions. Tradeoff between Bandwidth and Bitrate. Satellite Control Ground stations. Functions of the control stations. Frequency and Time , Baseband , and RF subsystems. Satellite Station Keeping Maneuvers.

2- Overall aims of the course:

The overall aims of the course are:

1- Develop students' knowledge of Orbital Parameters and Terms and how to perform orbital corrections.
2- Enrich student knowledge about the Space dynamics and Orbitography.
3- Increase Student Skills in the design of The satellite communications links.
4- Increase the student technological information about the satellite subsystems.
5- Develop students' knowledge of the different Satellite services.

3- Intended Learning Outcomes of Course (ILOs):

Upon successful completion of the course, the student should be able to:

a- Knowledge and understanding:

a1. Estimate the fundamental satellite orbital terms and parameters.
a2. Define the main functions and constructions of the satellite subsystems: P/L, ADCS, EPS, TCR.
a3. Classify between the different Time standards and calendars.
a4. Relate any of the following coordinate system to another: Perifocal Coordinate System. Topocentric Coordinate System– Geocentric Inertial Coordinate System.
a5. Estimate of the Power Budgets, for the Uplink and Downlink channels and Power-Bandwidth Trade-off.
a6. Classify between the SCPC and MCPC methods of transmission.
a7. Explain the construction and functions of the ground control stations (GCS).

b- Intellectual skills:

b1. Apply the different techniques to the power budget calculations.
b2. Analyze the obtained results both individually or as a part of a team.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Contents:

Topic	No. of Hours	Lecture	Tutorial/ practical
Introduction to satellite systems. Satellite services, frequency allocation	1 week (5 hrs./week) = 5 hrs.	3 hr.	2 hr.
Satellite orbits. Kepler's laws. Orbital terms and parameters. Keplerian set.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Orbital perturbations. Effect of non-spherical Earth shape. Regression of nodes. Rotation of apsides. Atmospheric drag.	2 week (5hrs./week) = 10 hrs.	6 hr.	4 hr.
Calendars & Times. UTC , GMT , Julian Date. LEO, MEO, GEO orbits. Mid-Term Exam 1.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Tracking angles and arc of visibility. Coordinate systems. (IJK) , (PQW) , (SEZ) frames	1 week (5 hrs./week) = 5 hrs.	6 hr.	4 hr.
Sub-satellite subsystems: P/L ,EPS ,TCR,ADCS.	4 week (5 hrs./week)	12hr.	8hr.

Power Budget , C/N, C/N_o Ratios. SFD of a link. MCPC and SCPC transmission+Mid-Term Exam 2.	= 20 hrs.		
Antenna Systems. Parabolic , Cassegrain, and Gregorian syst. GCS stations. Bandwidth- Bitrate trade-off. FEC and RS Coding. QPSK modulation.	2 week (5 hrs./week) =10 hrs.	6 hr.	4 hr.
TOTAL	**75**	**45**	**30**

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- Teaching and learning methods:

See Appendix, table [3]

7- Student Assessment Methods:

Final exam:..40%
Semester work:
In Class Quizzes...10%
2 Midterms 30%
Performance/assignments...20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

Assessment schedule

Assessment 1	First Mid-Term Exam	Week 6
Assessment 2	Second Mid-Term Exam	Week 11
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 15

8- List of references:

Essential books (text books)

"Satellite Communication Systems", Dennis Roddy, 3rd edition. McGraw-Hill , International Edition, 2001.

Advanced Books:

"Satellite Communication Systems ", G.Maral & M.Bousquet , 3rd edition, John Wiley & Sons, 2001.

9- Facilities required for teaching and learning:

7.1- Lecture Hall
7.2- White board
7.3- Data show for presentations

Course coordinator: Prof.Dr. Lotfy Sakr
Head of Department: Prof. Dr. Kamel Mohamed Hassan
Date: November 2017

Appendix

Table (1) Course ILOs/Program ILOs Matrix

		Program ILOs					
		A5	A13	B1	B7	B8	B13
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Think in a creative and innovative way in problem solving and design.	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth.	Analyze and design communication systems based on the knowledge acquired.	Analyze the performance of microwave and antenna systems.
Course ILOs	a1	■					
	a2	■					
	a3		■				
	a4		■				
	a5		■				
	a6	■	■				
	a7	■	■				
	b1			■	■	■	
	b2					■	■

Table (2): Course Contents/Course ILOs Matrix

	Knowledge & Understanding							Intellectual Skills	
Topic	a1	a2	a3	a4	a5	a6	a7	b1	b2
Introduction to satellite systems. Satellite services, frequency alloc									
Satellite orbits. Kepler's laws. Orbital terms and parameters. Keplerian set.									
Orbital perturbations. Effect of non-spherical Earth shape. Regression of nodes. Rotation of apsides. Atmospheric drag.									
Calenders & Times. UTC , GMT , Julian Date. LEO, MEO, GEO orbits. Mid-Term Exam 1.									
Tracking angles and arc of visibility. Coordinate systems. (IJK) , (PQW) , (SEZ) frames									
Subsatellite subsystems: P/L, EPS, TCR, and ADCS. Power Budget, C/N, C/No Ratios. SFD of a link. MCPC and SCPC transmission. Mid-Term Exam 2.									
Antenna Systems. Parabolic , Cassegrain, and Gregorian syst. GCS stations. Bandwidth- Bitrate trade-off. FEC and RS Coding. QPSK modulation.									

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Knowledge & Understanding							Intellectual Skills	
Teaching	a1	a2	a3	a4	a5	a6	a7	b1	b2
Interactive Lecturing									
Discussion									
Problem Solving									

Table (4): Assessment Method/Course ILOs Matrix

	Knowledge & Understanding							Intellectual Skills	
Assessment	a1	a2	a3	a4	a5	a6	a7	b1	b2
Written Exams									
Tutorial Discussions									
Relative weights %	80 %							20 %	

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 525 Computer Communication Networks

Program (s) on which the course is given:	B.Sc. in Electronics and Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5th year – 2nd semester
Date of specification approval:	December-2017

A- Basic Information

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: COM 526

Professional Information

1- Catalogue Course Description:

Classification of computer communication networks, Transmission media, Access control, Fundamentals of queuing theory, Unicast routing protocols. Transport layer protocols. Multimedia. Application layer protocols. Security in computer networks.

Overall Aims of the Course:

At the end of the course, student should be able to

- ✓ Understand the wired and wireless transmission media used in computer networks
- ✓ Understand access control and routing techniques used in computer networks.
- ✓ Understand TCP and UDP transport layer
- ✓ Be familiar with basics of queuing theorems applied to computer network
- ✓ Be familiar with main application layer protocols
- ✓ Be familiar with computer security basics

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a.1- Recognize the characteristics of transmission media used in computer network
a.2- Demonstrate the knowledge of routing, access techniques

b- Intellectual Skills

By the end of this course the student should be able to:

b.1 –Apply appropriate mathematical knowledge to understand queuing theorem and network security.
b.2.- Analyze simple network protocols

c- Professional and Practical Skills

By the end of this course ,the student should be able to:

C1-Merge the knowledge of communication to the analysis and design of computer networks

C2 –Apply theories of mathematics to analyze computer networks.

d-General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team.
d2. Communicate effectively.
d3. Demonstrate efficient IT capabilities.
d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Overview on computer networks	3	2	5
2	Transmission media in computer networks	3	2	5
3	Access control in computer networks	6	4	10
4	Unicast routing protocols.	6	4	10
5	TCP , UDP Transport protocols.	6	4	10
6	Multimedia.	6	4	10
7.	Application layer protocols.	6	4	10

8.	Security in computer networks	6	4	10
9.	Elements of Queuing theorem.	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Communication lab	Identifying the important windows network utilities
Experiment#2	Communication lab	Introduction to packet sniffing
Experiment#3	Communication lab	ARP
Experiment#4	Communication lab	The internet protocol (IP)

4- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment:

- Final exam:..40%
- Semester work:
  - In Class Quizzes and Participation 20%
  - Mid-Term Exams..................................30%
  - Assignment..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

[1]William Stallings'Data and Computer Communications',10th Edition

[2]BA.Forouzan 'Data Communications and Networking'5th Edition

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Prof. Dr. Ali Elmoghazy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	Spring 2017	

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs												
	A03	A05	A14	B01	B02	B03	B04	C01	C02	D01	D03	D04	D06
	Basics of information and communication technology	Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Basic concepts of data transmission and data computer networks	Think in a creative and innovative way in problem solving and design	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems	Use software tools to develop computer programs for engineering applications	Write a technical report on a project or an assignment.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Merge the knowledge of electronic and communication systems to improve design, products and services.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Demonstrate efficient IT capabilities	Effectively manage tasks, time, and resources.
a1.													
a2.													
b1.													
b2.													
c1.													
c2.													
d1.													
d2.													
d3.													
d4.													

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs									
	Knowledge & Understanding		Intellectual Skills		Practical Skills		General Skills			
	a1	a2	b1	b2	c1	c2	d1	d2	d3	d4
Overview on computer networks										
Transmission media in computer networks										
Access control in computer networks										
Unicast routing protocols.										
TCP , UDP Transport protocols.										
Multimedia.										
Application layer protocols.										
Security in computer networks										
Elements of Queuing theorem.										

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs									
	Knowledge & Understanding		Intellectual Skills		Practical Skills		General Skills			
	a1	a2	b1	b2	c1	c2	d1	d2	d3	d4
Lecture										
Tutorial										
Laboratory/ Assignments										

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs									
	Knowledge & Understanding		Intellectual Skills		Practical Skills		General Skills			
	a1	a2	b1	b2	c1	c2	d1	d2	d3	d4
Written Exams										
Lab Report and Discussion										
Relative weight %	30%		40%		20%		10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 526 Data Communications

Programme(s) on which the course is given: B.Sc. in Electronic & Communication Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic Level: Level 5 – 9th smester
Date of specification approval: November 2017

A- Basic Information

Title: Data Communications **Code: COM 526**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: **COM 412 Communication 2**

B- Professional Information

1- Catalog Course Description:

Basic concepts of data transmission, data networks and the internet. Computer models (ISO/OSI and TCP/IP) modems and xDSL, error control, flow control, data link control protocols, sliding window and ARQ, HDLC, statistical multiplexing, line codes, circuit and packet switching, timing diagrams, frame relay, ATM, routers. Multiple-Access techniques. Local Area Networks. Giga Ethernet. Wireless LAN (IEEE 802.11x).Local Area Networks: Wired(Ethernet) generations up to 100Giga Ethernet, Wireless LAN generations :IEEE802.11(b,a,g,n,ac,ad),ISM bands ,Bluetooth ,WiMax(IEEE802,16)

2- Overall aims of the course:

The Main aims of this course are:

- To enrich students' knowledge about data communication and computer networks.
- Develop students' skills to analyse simple protocols used in computer networks.
- Share ideas and work in a team or a group.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:
By the end of this course the student should, be able to:

a1. Illustrate the understanding of data communication basic concepts.
a2. List the main characteristics of communication links used in data communications.
a3. Recognize the different types of error and flow control.
a4. Explain the functions and protocols used in each of 5-layer model.
a5. Distinguish the addressing methods in computer networks
a6. Estimate the relevant protocols for real and non-real time traffic

b- Intellectual skills:
By the end of this course the student should, be able to:

b1. Analyse the performance of simple protocols.
b2. Calculate the different delay components in data transmission
b3. Develop a software code in error control algorithms using MATLAB.

c- Professional and practical skills:
By the end of this course the student should, be able to:

c1. Conduct knowledge of mathematics and logic design to data communication
c2. Build a software code using modern software tools for protocol sniffing.
c3. Prepare a report concerning the standard protocol.

d- General and transferable skills:
By the end of this course the student should, be able to:

d1. Communicate effectively with other people using visual, graphic, written and verbal means.
d2. Demonstrate Efficient IT capabilities using modern software tools.
d3. Manage time to meet deadlines.

4- Course ILOs versus Program ILOs relation
See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	Basic concepts of data transmission and computer networks	12	8	20
2	Addressing in computer networks	9	6	15
3	Network layered models and protocols	9	6	15
4	Error control techniques	9	6	15
5	Ethernet,WiFi ,Bluetooth and WiMax	6	4	10
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Final exam:..40%
- Semester work:
    - In Class Quizzes..10%
    - 2 Midterms 30%
    - Performance/assignments...20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book:
   Behrouz Forouzan “Data communication and networking”5th Edition

2. Recommended Readings:
   W.Stallings”Data and computer communications” 10th Edition

9- Facilities required for teaching and learning:

- White board
- Data show for presentations

Course coordinator: **Prof. Dr. Kamel Hassan**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November - 2017**

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		Program ILOs												
		A03	A13	A14	B01	B02	BO3	C01	C04	C10	D0 3	D0 4	D0 6
		Basics of information and communication technology	Theories ,techniques and technology in the field of communication links including satellite, optical fiber and mobile communication systems	Basic concepts of data transmission and data computer networks	Think in a creative and innovative way in problem solving and design	Apply appropriate mathematical and physics knowledge for modelling and analysing electronic and communication systems problems	Use software tools to develop computer programs for engineering applications	Apply theories and techniques of mathematics, basic science and information technology to solve electronic and information system problems	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results	Edit and present technical report	Communicate effectively	Demonstrate efficient IT capabilities	Effectively manage tasks, time, and resources.
Course ILOs	a1.												
	a2.												
	a3.												
	a4.												
	a5.												
	a6.												
	b1.												
	b2.												
	b3												
	c1												
	c2												
	c3												
	d1												
	d2												
	d3												

Table [2]: Course Content/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Basic concepts	■	■						■	■	■			■		
Addressing					■										
Layered models and protocols				■		■	■		■	■	■	■	■	■	■
Error control			■						■						
LANs		■											■		

Table [3]: learning/teaching Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3
Interactive Lecturing	■	■	■	■	■	■	■	■	■							
Discussion	■	■	■	■	■	■	■	■	■					■		
Problem Solving							■	■	■	■						
Experiential Learning										■	■	■	■	■	■	■

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Assignments										■	■	■	■	■	■	■
Quizes	■	■	■	■	■	■	■	■	■							
Midterm & Final Exam	■	■	■	■	■	■	■	■	■							
Overall Percentage	15 %	5 %	5 %	5 %	5 %	5 %	10 %	10 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 527: Optical Fibre Communication Systems

Program(s) on which the course is given:	B.Sc. in Electronics & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5th level – 9th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Optical Fiber Communication Systems **Code: COM 527**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 412: Optical Electronics and COM 412: Communications 2

B- Professional Information

1- Catalogue Course Description:

Overview of optical fiber communications: Historical review, the general system, and the main features. Optical Fiber waveguides: Ray theory transmission, Electromagnetic mode theory for optical propagation. Cylindrical fiber: modes, mode coupling, Step index fiber, Graded index fiber. Single mode fiber: cutoff wavelength, Mode field diameter (MFD), Effective, refractive index, and Gaussian approximation. Transmission Characteristics of optical fibers: Attenuation (material absorption, linear scattering losses, nonlinear scattering losses, and fiber bend loss, Transmission). Dispersion inter-modal dispersion, chromatic dispersion, overall dispersion. Modified single mode dispersion: DSFs, DFFs, and NZ DFs.
Optical fibers: Multi-mode Step-index fiber, Multi-mode Graded-index fiber, Single mode fiber, Plastic-clad fiber, Plastic optical fibers. Direct detection receiver performance: Noise, Receiver noise, Receiver structure. Optical fiber systems (Direct detection): introduction, Transmitter circuits, Receiver circuits, Digital system design considerations, check the system design parameters of an optical fiber link using power budget and rise time budget. Wavelength division multiplexing techniques. Optical amplifiers (SOAs and fiber amplifiers). Optical fiber Measurements: Fiber attenuation measurements, fiber dispersion measurements, Fiber cutoff wavelength, and Fiber NA measurements.

2- Overall Aims of the Course:

- ✓ Recognize the principles of operation for optical fiber waveguides as well as the transmission characteristic of optical fiber.
- ✓ Develop the students' knowledge about optical fiber communication systems.
- ✓ Prepare students to analyze the components of optical fiber communication system.
- ✓ Perform the basic calculation of optical power budget as well as the rise time budget.
- ✓ Practice students to perform basic experiments on optical fiber systems.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Recognize the essentials of wave propagation through optical fibers.

a2. Describe the transmission characteristics of signals over optical fibers and to be aware of the practical and fundamental limits.

a3. Review the main features of the different types of OFs, connection problems and the appropriate applications.

a4. Summarize the operating principles of optical transmitter and receiver systems.

a5. Interpret the latest development in optical fiber systems.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Analyze the main parameters related of the main blocks of the optical fiber communication link

b2. Compare the different types of sources, fibers, and optical detectors

b3. Estimate the power budget and rise time budget of an optical fiber link.

b4. Design a digital optical fiber link based on direct detection

c- Professional and Practical Skills

By the end of this course, the student should be able to:

c1. Interpret the performance parameters for optical fiber communication subsystems.

c2. Justify the appropriate software for optical fiber link designed.

c3. Perform the basic measurements related to characterization of optical fibers, optical transmitter, and optical receivers' parameters.

c4. Display the data sheets and choose the adequate components for building up a fiber communication link.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Demonstrate a self-directed manner.

d2. Show the ability to work coherently and successfully as a part of a team.

d3. Manage time and meet deadlines.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Overview of optical fiber communications: Historical review, the general system, and the main features.	3	2	5
2	Optical Fiber waveguides: Ray theory transmission, Electromagnetic mode theory for optical propagation.	3	2	5
3	Optical Fiber waveguides (Continued) Cylindrical fiber: modes, mode coupling, Step index fiber, Graded index fiber	3	2	5
4	Optical Fiber waveguides (Continued) Single mode fiber: cutoff wavelength Mode field diameter (MFD), Effective refractive index, and Gaussian approximation	3	2	5
5	Transmission Characteristics of optical fibers: Attenuation{material absorption, linear scattering losses, nonlinear scattering losses, and fiber bend loss	3	2	5
6	Transmission Characteristics of optical fibers(continued): Dispersion inter-modal dispersion, chromatic dispersion, overall dispersion,	3	2	5
7	Dispersion(continued) modified single mode dispersion: DSFs, DFFs, and NZ DFs	3	2	5
8	Optical fibers: Multi-mode Step-index fiber, Multi-mode Graded-index fiber, Single mode fiber, Plastic-clad fiber, Plastic optical fibers.	3	2	5
9	Direct detection receiver performance: receiver noise, receiver structure	3	2	5
10	Optical fiber systems {Direct detection}: introduction, Transmitter circuits, Receiver circuits, Digital system design considerations, optical power budget, and rise time budget. Check the system design parameters of an optical fiber link using Optisystem software. Wavelength division multiplexing techniques	6	4	10
11	Optical amplification (SOAs and fiber amplifier)	3	2	5
12	Optical fiber Measurements: Fiber attenuation measurements, fiber dispersion measurements, Fiber cutoff wavelength, and Fiber NA measurements.	6	4	10
13	Revision	3	2	5
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	O.F.C. Lab.	Optical fiber connections: joints, couplers and isolators
Experiment#2	O.F.C. Lab.	Familiarization of EDFA
Experiment#3	O.F.C. Lab.	Internal modulation of a LD
Experiment#4	O.F.C. Lab.	Geometric loss effect {critical bending radius}.
Experiment#5	O.F.C. Lab.	Performing Splicing of fibers using the splicing machine….
Experiment#6	O.F.C. Lab.	Familiarization and application of OTDR

6- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment:

- Final exam:..40%
- Semester work:
  - In Class Quizzes and Participation 20%
  - Mid-Term Exams..................................30%
  - Assignments and Lab Experiments..............10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

Text Book:

1. John M. Senior "Optical Fiber Communications Principle and Practice", Third Edition, Prentice Hall,2009.

References:

2. Josef C. Palais, "Fiber Optic Communication", Prentice Hall.
3. Alan Rogers, "Essentials of Photonics" Second Edition, CRC Press, 2009.

9- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- O.F.C. Lab.

Course coordinator:	Prof. Dr. Kamel Hasan	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): The course ILOs are mapped to the program ILOs.

Course ILOs	A 08	A13	B02	B07	B08	B 15	C01	C03	C04	C06	C12	C13	D02	D 03	D 06
Program ILOs	Principles and applications of photonics.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth.	Analyze and design communication systems based on the knowledge acquired	Analyze the performance of photonic devices and systems	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems	Design a process, component or system and practice the quality of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Perform practical measurements of the microwave, antenna, and communication links.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Perform the practical measurements of the photonic devices and systems	Work in stressful environment and within constraints	Communicate effectively.	Effectively manage tasks, time, and resources.
a1.	■	■													
a2.	■	■													
a3.	■	■													
a4.	■	■													
a5.	■	■													
b1.			■			■									
b2.			■			■									
b3.				■	■	■									
b4.				■	■	■									
c1.						■	■	■				■			
c2.									■			■			
c3.										■		■			
c4											■	■			
d1.													■		
d2.														■	
d3.															■

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs: Knowledge & Understanding					Intellectual Skills				Practical Skills				General Skills		
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3
Overview of optical fiber communications	■	■														
Optical Fiber waveguides	■	■														
Transmission Characteristics of optical fibers:		■				■				■				■		
Dispersion		■	■											■		
Optical fiber types			■				■							■		
Direct detection receiver performance				■				■						■		
Optical fiber systems				■	■				■		■		■	■		
Optical Amplification				■								■		■	■	
Optical fiber Measurements:				■								■		■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs: Knowledge and understanding					Intellectual Skills				Professional and practical skills				General and transferable skills		
	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3
Interactive Lecture	■	■	■	■	■	■	■	■	■							
Discussion	■	■	■	■	■	■	■	■	■							
Problem Solving						■	■	■	■				■			
Experimental Learning										■	■	■	■			
Cooperative Learning										■	■	■	■	■	■	■
Research						■	■	■	■					■	■	■
Project and Assignment										■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Practical Skills				General Skills		
Assessment Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3
Written Exams																
Reports and Discussion																
Lab work and Project																
Relative weight %	30%					50%				15%				5%		

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

Program (s) on which the course is given:	B.Sc. in (Electronics and Communication Engineering)
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2017/2018	5th year – 10th semester – Spring 2018 – Level 5
Date of specification approval:	November 2017

A-Basic Information

Title: **Digital Television System** **Code: COM 530**
Credit Hours: **3 Cr. Hrs.**
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisite: **Communication 2** **COM 412**

B-Professional Information

1- Catalog Course Description

Composite analog TV signal. Digital Component signals. Required Bitrate for a digital TV channel broadcasting. Video Compression techniques: MPEG 2, MPEG 4 (Moving Picture Expert Group). Digital Video Broadcasting (DVB). Friis transmission equation , Link budget calculations.Levels and Profiles in video broadcasting. Parameters for the standard Digital Video Broadcasting (DVBS). Advanced Digital Video Broadcasting (DVBS2). The High Definition TV (HDTV). Broadcasting of HDTV channels. Application of DVBS2 and MPEG 4 in the HDTV Broadcasting. The Ultra HDTV. 4K HDTV , 9K HDTV. Effects of FEC ratio, QPSK , 8PSK on the number of broadcasted TV channels on a given satellite transponder bandwidth.

Overall aims of the course:

The Course aims to provide:

1- Develop students' knowledge of the Digital Television Systems,Types of broadcasting and Compression Techniques.
2- Enrich students' knowledge of the levels and profiles in the broadcasting.
3- Develop students' knowledge of the parameters of the standard digital video broadcasting (DVBS)and the advanced one (DVBS2).
4- Enrich student knowledge of the difference between the MPEG 2 and MPEG 4 compression techniques.
5- Develop students' knowledge of the differences between TVS , HDTV , UHDTV, 4KHDTV , 9KHDTV.
6- Effects of choosing FEC ratio, QPSK , 8PSK ,QAM modulation techniques on the number of broadcasted TV channels on a given satellite transponder bandwidth.

2- Intended Learning Outcomes of Course (ILOs):

Upon successful completion of the course, the student should be able to:

a- Knowledge and understanding:

a1-The Required Bitrate for a digital TV channel broadcasting.

a2-The Digital Video Broadcasting (DVB) and the Compression Techniques MPEG 2 , MPEG 4.

a3- The differences between TVS , HDTV , UHDTV, 4KHDTV , 9KHDTV.

a4- How to choose the FEC ratio, QPSK , 8PSK ,QAM modulation techniques to maximize the number of channels broadcasted per satellite transponder.

a5- Define and estimate of the Power Budget , determination of (C/N_o) ratio for a communication Channel.

b- Intellectual skills:

b1- Apply the different characteristics in the choice between the defferent digital systems.

b2-Comparaison between IPTV and TVS. **Professional & Practical skills:**

c1-

c2-

Professional & Practical skills:

d1 –

d2 –

d3 –

3- Contents:

Topic	No. of Hours	Lecture	Tutorial/practical
Introduction to Digital TV signal. Digital Component signals	1 week (5 hrs./week) = 5 hrs.	3 hr.	2 hr.
Digital TV channel broadcasting	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Video Compression techniques: MPEG 2, MPEG 4 (Moving Picture Expert Group). Digital Video Broadcasting (DVB).	2 week (5hrs./week) = 10 hrs.	6 hr.	4 hr.
Friis transmission equation , Link budget calculations, determination of (C/No) ratio for a communication Channel. . Mid-Term 1Exam.	2 week (5 hrs./week) = 10 hrs.	6 hr.	4 hr.
Levels and Profiles in video broadcasting.	1 week (5 hrs./week) = 5 hrs.	3 hr.	2 hr.
Parameters for the standard Digital Video Broadcasting (DVBS). Advanced Digital Video Broadcasting (DVBS2). The High Definition TV (HDTV). Effects of FEC ratio, QPSK , 8PSK and DVBS2 on the number of broadcasted TV channels on a given satellite transponder bandwidth. Mid-Term Exam 2.	4 week (5 hrs./week) = 20 hrs.	12hr.	8hr.
Application of DVBS2 and MPEG 4 in the HDTV Broadcasting. The Ultra HDTV. 4K HDTV , 9K HDTV.	3 week (5 hrs./week) =15 hrs.	9 hr.	6 hr.
TOTAL	**75 hrs.**	**45 hrs.**	**30 hrs.**

4- Lab Experiments:

5- Teaching and learning methods:

5.1- Lectures
5.2- Tutorials

6- Student Assessment Methods:

5-1- **Mid Term Exams** to assess the skills of problem solving, understanding of the course topics.

5.2- **Tutorials** to assess the ability of solving examples corresponding to the course topics.

5.3- Final Written exam to assess the comprehensive understanding of the scientific and technological background of the course, to assess the ability of problem solving.

Assessment schedule

Assessment 1	First Mid-Term Exam	Week 6
Assessment 2	Second Mid-Term Exam	Week 10
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 15

Weighting of assessments

Attendance	5 %
Quizzes	5%
Mid-term exams	50 %
Final-term examination	40 %
Total	**100 %**

7- List of references:

6.1- Course notes

No course notes are required

6.2- Essential books (text books)

8- Facilities required for teaching and learning:

7.1- Lecture Hall
7.2- White board
7.3- Data show for presentations

Course coordinator: **Prof.Dr. Lotfy Sakr**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: November 2017

Appendix

Table (1) Course ILOs/Program ILOs Matrix

		A3	A10	A12	A13	A15	B1	B2	B4	B7	B9
		Basics of information and communication technology.	Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Theories, techniques, analysis of analog and digital signals processing.	. Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication	Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering..	Think in a creative and innovative way in problem solving and design..	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems..	. Write a technical report on a project or an assignment.	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth.	Combine, exchange, and assess different ideas and knowledge from range of sources for solving electronic and communication systems problems.
Course ILOs	a1	■	■	■							
	a2				■	■					
	a3	■				■					
	a4				■						
	a5				■						
	b1						■	■	■	■	
	b2										■

Table (2): Course Contents/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills	
Topic	a1	a2	a3	a4	a5	b1	b2
The Required Bitrate for a digital TV channel broadcasting.							
The Digital Video Broadcasting (DVB) and the Compression Techniques MPEG 2 , MPEG 4.							
The differences between TVS , HDTV , UHDTV, 4KHDTV , 9KHDTV.							
How to choose the FEC ratio, QPSK , 8PSK,QAMmodulation techniques to aximize the number of channels broadcasted per satellite transponder.							
Define and estimate of the Power Budget , determination of (C/No) ratio for a communication Channel.							
Apply the different characteristics in the choice between the defferent digital systems. Mid-Term Exam 2.							
Comparaison between IPTV and TVS.							

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills	
Teaching	a1	a2	a3	a4	a5	b1	b2
Lecture							
Tutorial							
laboratory							

Table (4): Assessment Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills	
Assessment	a1	a2	a3	a4	a5	b1	b2
Written Exams							
Tutorial and Discussions							
Relative weights %	80%					20%	

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Electrical Engineering Department

Course Specifications

COM 531: Acoustics and Ultrasonic Engineering

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5th level
Date of specification approval:	November 2017

A- Basic Information

Title: Acoustics and Ultrasonic Engineering **Code: COM 531**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: EPR 364.

B- Professional Information

1- Catalogue Course Description:

Plane and spherical waves, Simple and compound sound sources, Dynamically analogous mechanical and acoustical circuits, Acoustic transducers, Loudspeakers: types and systems, Microphone: types and systems, Measurements of sound, Acoustics and Hearing, Acoustic environment outdoors, Acoustic environment indoors, Ultrasonic applications.

Overall Aims of the Course:

Upon successful completion of the course, the student should be able to:

- ✓ Understand fundamental physical quantities and nature of sound.
- ✓ Understand the idea of the sound level meter, and the human auditory system.
- ✓ Understand sound propagation indoors and outdoors, point sources and linear sources.
- ✓ Understand the concept of reverberation time, environmental correction factor K2.
- ✓ Understand sound absorption & sound insulation, and microphone.
- ✓ Understand sound spectrum and frequency analysis.
- ✓ Understand the concept of silencers, muffling devices, and loudspeakers.

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1-Demonstrate knowledge and understanding of concepts and theories of Acoustics and Ultrasonic Engineering.

a2- Illustrate and describe solving techniques of sound propagation indoors and outdoors.

a3- Illustrate and describe theorems for designing ultrasonic applications.

a4- Identify problems affecting the performance of sound absorption & sound insulation, and microphone.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Ability to define and analyze different ultrasonic systems.

b2. Ability to apply different acoustical and ultrasonic solutions.

b3. The ability to select acoustical and ultrasonic systems according to system requirement and customer needs.

b4. Evaluate the performance of different acoustical and ultrasonic systems.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Designing different acoustical systems.

c2. Designing different digital ultrasonic systems.

c3 Test the performance of different acoustical and ultrasonic systems.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within teams

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction, Nature of sound, fundamental physical quantities	1 week (3 rs./week) 3 hrs.	2 hrs	5 hrs
2	The Sound Level Meter, Human auditory system	2 week (3 rs./week) = 6 hrs.	4 hrs	10 hrs
3	Sound Propagation indoors and outdoors. Point sources, Linear sources.	2 week (3 rs./week) = 6 hrs.	4 hrs	10 hrs
4	Noise screens, Reverberation time, Environmental correction factor K2	2 week (3 rs./week) = 6 hrs.	4 hrs	10 hrs
5	Sound absorption & Sound insulation.	2 week (3 rs./week) = 6 hrs.	4 hrs	10 hrs
6	Microphones	2 week (3 rs./week) 6 hrs.	4 hrs	10 hrs
7	Sound Spectrum and frequency analysis	2 week (3 rs./week) 6 hrs.	4 hrs	10 hrs
8	Silencers, Muffling Devices, an Loudspeakers	2 week (3 rs./week) = 6 hrs.	4 hrs	10 hrs
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Adobe Audition	Program for sound recording and playback, waveform editor, simple FFT analysis, sonogram, multitrack recorder, and it can act as a "host" program for plugins in three different formats (VST, Direct-X, XFM).
Experiment#2	Aurora	Suite of XFM plugins for Adobe Audition: generation of test signals (MLS, sweep) computation of the impulse response, acoustic parameters according to ISO 3382, calculation of inverse filters. Includes a fast convolution module, which is employed for performing auralization.
Experiment#3	SpectraPLUS	FFT and fractional-octave frequency analysis, cross-spectrum, sonogram, waterfall, WAV files.
Experiment#4	SpectraPLUS	signal generator for acoustic testing, measurement of reverberation times. Works with one or two channels, can be used to record and analyze

4- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:...40%
- Semester work:

- In Class Quizzes and participations 20%
- Mid-Term Exams 30%
- Electronic and computer Lab Experiments 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- ✓ **Recommended book** (text books): Heinrich Kuttruff, Acoustics: An Introduction, Taylor & Francis, 2007.

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Prof. Dr. Kamel Hassan	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs								
		A13	A17	B2	B8	C3	C8	D1	D3	D6
		Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Analyze and design communication systems based on the knowledge acquired.	Design a process, component or system and practice the quality of electronic and communication systems.	Apply quality assurance and follow the appropriate codes and standards.	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a1.									
	a2.									
	a3.									
	a4.									
	b1.									
	b2.									
	b3.									
	b4.									
	c1.									
	c2.									
	c3.									
	d1.									
	d2.									
	d3.									

Table (2): Course Content/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills		
Topic	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3
Introduction, Nature of sound, fundamental physical quantities	■			■									
The Sound Level Meter, Human auditory system	■	■		■	■								
Sound Propagation indoors and outdoors. Point sources, Linear sources.		■			■	■		■			■	■	
Noise screens, Reverberation time, Environmental correction factor K2			■		■	■				■			
Sound absorption & Sound insulation.	■	■				■			■				
Microphones	■	■				■			■		■	■	
Sound Spectrum and frequency analysis			■			■	■		■		■	■	■
Silencers, Muffling Devices, an Loudspeakers			■				■			■		■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills		
Learning/Teaching Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3
Interactive Lecturing	■	■	■	■	■	■	■						
Discussion	■	■	■	■	■	■	■						
Laboratory								■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding			Intellectual Skills				Practical Skills				General Skills			
Assessment Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■							
Lab Report and Discussion									■	■	■	■	■	■	■
Relative weight %	30%			40%				20%				10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 561: Digital Signal Processing

Programme(s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	4^{th} year – 8^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Digital Signal Processing **Code: COM 561**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	COM 362: Signal Analysis.

B- Professional Information

1- Catalogue Course Description:

Digital filter design: finite impulse response, Infinite impulse response, Adaptive digital filters: concepts, algorithms, applications, Speech coders: speech signal analysis, waveform coders, vocoders, hybrid coders, Image processing: image coding, image enhancement, image compression.

2- Overall aims of the course:

The Main goals of this course are:

- Develop students' knowledge about the fundamentals of digital signal processing (DSP) systems and their evolution.
- Prepare students to design digital filters.
- Train students to evaluate the performance of digital filters.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Explain the fundamentals and theories of linear time-Invariant (LTI) systems.

a2. Explain the fundamentals and theories of the Z-Transform and Inverse Z-Transform, applied to discrete time signals and systems.

a3. Explain the fundamentals and theories of the discrete-time signals, and the frequency domain representation of sampling.

a4. Explain the FIR and IIR filter design techniques and state their related terms.

a5. Interpret the principles of digital filters and their application in different communication systems.

b- Intellectual skills:

By the end of this course the student should be able to:

b1. Analyze and design LTI systems and digital filters.

b2. Use software tools in programming different DSP systems and evaluate their performance.

b3. Establish a technical design report on an assignment.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec.	Tut.	Total
1	Discrete Time Signals and their operations	3	2	5
2	Discrete Time systems and their properties	6	4	10
3	Linear Time-Invariant Systems	3	2	5
4	Z-Transform and Inverse Z-Transform	9	6	15
5	Periodic Sampling	3	2	5
6	Frequency Domain Representation of Sampling	3	2	5
7	Continuous-Time Processing of Discrete-Time Signals	3	2	5
8	Digital Processing of Analog Signals	6	4	10
9	FIR and IIR Filter Design Techniques	9	6	15
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- learning/teaching methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..............................30%
  - In Class Quizzes..............................10%
  - Performance....................................20%
- **Total..100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- ✓ **Course notes:** Instructor notes**.**
- ✓ **Recommended book (text books):** Alan V. Oppenheim *et al.*, *Discrete-Time Signal Processing*, Prentice-Hall, Inc., 1999.
- ✓ **Essential books (text books):** B. P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 2010.

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Computer Lab.

Course coordinator:	Associate Prof. Dr. Waleed Al-Hanafy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/Program ILOs Matrix

		Program ILOs				
		A5	A12	B1	B3	B4
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Theories, techniques, analysis of analog and digital signals processing.	Think in a creative and innovative way in problem solving and design.	Use software tools to develop computer programs for engineering applications.	Write a technical report on a project or an assignment.
Course ILOs	a1	■				
	a2	■				
	a3		■			
	a4		■			
	a5		■			
	b1			■		
	b2				■	
	b3					■

Table (2): Course Contents/Course ILOs

		Course ILOs							
		Knowledge & Understanding					Intellectual Skills		
	Topic	a1	a2	a3	a4	a5	b1	b2	b3
Course Contents	Discrete Time Signals and their operations	■					■		
	Discrete Time systems and their properties	■					■		
	Linear Time-Invariant Systems	■					■		
	Z-Transform and Inverse Z-Transform		■				■		
	Periodic Sampling			■			■		
	Frequency Domain Representation of Sampling			■			■		
	Continuous-Time Processing of Discrete-Time Signals			■			■		
	Digital Processing of Analog Signals				■	■	■	■	
	FIR and IIR Filter Design Techniques				■	■	■	■	■

Table (3): Teaching Methods/Course ILOs Matrix

	Course ILOs							
	Knowledge & Understanding					Knowledge & Understanding		
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3
Interactive Lecture								
Discussion								
Problem Solving								
Project/Assignment								

Table (4): Assessment Methods/Course ILOs Matrix

	Course ILOs							
	Knowledge & Understanding					**Intellectual Skills**		
Topic	**a1**	**a2**	**a3**	**a4**	**a5**	**b1**	**b2**	**b3**
Written Exams								
Assignment and Report								
Relative weight %	40%					60%		

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 581: Special Topics in Electronics & Communication Engineering (Software Tools Applications)

Programme(s) on which the course is given: B.Sc. in Electronics & Communication Engineering
Major or minor element of programmes:
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic year/Level: 5^{th} level – 9^{th} Semester
Date of specification approval: November 2017

A- Basic Information

Title: Special Topics in Electronics & Communication Engineering **Code:** COM 581

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	

B- Professional Information

1- Catalogue Course Description:

Practical applications in electronic and communication engineering using software tools. The software tools to be used are MATLAB, Simulink, LabVIEW, and Multisim. Applications include -but not limited to- analog and digital oscillator circuits, combinational and sequential logic circuits, analog and digital communication systems and circuits, control systems and filters, random signal and noise in communication systems, and receiver characterist ics in communication.

2- Overall aims of the course:

The Main Goals of this course are:

- Develop students' skills in software tools (MATLAB, Simulink, Multisim and LabVIEW) for problem solving and modeling of various electronic circuits.
- Train students' in a programming environment through data acquisition for performing real-time measurements.

3- Intended learning outcomes of course (ILOs):

A. Knowledge and understanding:

By the end of this course the student should be able:

a1. List theories, techniques and analysis of analogue and digital electronics, communication and signal processing systems.

a2. Recognize the instruction set and program structure of MATLAB and Simulink for problem solving

a3. Recognize of the instruction set and program structure of LabVIEW and Multisim as an electronic simulation tool

B. Intellectual skills:

By the end of this course the student should be able to:

b1. Apply appropriate mathematical and physics knowledge for modelling and analysing electronic and communication systems problems

b2. Use software tools to develop computer programs for engineering applications and simulation.

b3. Design communication systems to solve communication systems problems such as communication links and channels.

C. Professional and practical skills:

By the end of this course the student should be able to:

c1. Build a software code to solve electronic and communication problems using theories and techniques of mathematics, basic sciences.

c2. Design a real model for data acquisition, and give simulation, some practical implementing.

c3. Read thoroughly datasheets and identify appropriate specifications for required system or component.

D. General and transferable skills:

By the end of this course the student should be able to:

d1. Demonstrate efficient IT capabilities.

d2. Effectively Manage tasks, time, and resources

d3. Search for information and engage in life-long self-learning discipline.

d4. Relate to relevant literatures

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	MATLAB and Simulink Basics,	6	4	10
2	LabVIEW fundamentals	6	4	10
3	Random Signal and noise generation	6	4	10
4	Analog Communication Modulation techniques AM, FM, PM, PAM, PPM, and PWM applications	6	4	10
5	Digital Communication Modulation techniques ASK, FSK, PSK and BER measurements + Mid Term 1	6	4	10
6	Analog Filters design.	6	4	10
7	Analog and Digital Oscillators	6	4	10
8	Logic Circuit design and simulation + Mid Term 2	3	2	5
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Final exam:...40%
- Semester work:
  - In Class Quizzes...10%
  - Assignments/Midterm exams...................................40%
  - Performance...10%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. MATLAB, Simulink, Lab VIEW, and Multisim user guides and manuals
2. Students Lecture Notes and PPT's.
3. Handouts.
4. Internet resources and sites.

9- Facilities required for teaching and learning:

- Latest software versions for MATLAB, Simulink, Multisim, and LabVIEW
- White board
- Data show for presentations
- Video tutorials for the used software.
- Internet tutorial sites.

Course coordinator: **Dr. Kamel Hassan**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: **November - 2016**

Appendix

Table [1] : Course ILOs / Program ILOs

		Program ILOs										
		A12	A13	B2	B3	C1	C3	C12	D4	D6	D7	D9
		Theories, techniques, analysis of analog and digital signals processing.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic & communication systems problems.	Use software tools to develop computer programs for engineering applications.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Design a process, component or system and practice the neatness and aesthetics of electronic and communication systems.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Demonstrate efficient IT capabilities.	Effectively manage tasks, time, and resources.	Search for information and engage in life-long self-learning discipline.	Refer to relevant literatures.
Course ILOs	a1.											
	a2.											
	a3.											
	b1.											
	b2.											
	b3.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											
	d3.											
	d4.											

Table [2] : Course Contents / Course ILOs

	Knowledge & Understanding			Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
MATLAB and Simulink Basics,													
LabVIEW fundamentals													
Random Signal and noise generation													
Analog Communication Modulation techniques AM, FM, PM, PAM, PPM, and PWM applications													
Digital Communication Modulation techniques ASK, FSK, PSK and BER measurements													
Analog Filters design.													
Analog and Digital Oscillators													
Logic Circuit design and simulation													

Table [3]: learning/teaching Method/ILO Matrix

	Knowledge & Understanding			Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing													
Discussion													
Software tools													

Table [3]: learning/teaching Method/ILO Matrix

	Knowledge & Understanding			Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Assignments													
Quizzes													
Midterm & Final Exam													
Overall Percentage	10%	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 582 Introduction to Information Theory

Program (s) on which the course is given:	B.Sc. in Electronics and Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5th year – 2nd semester
Date of specification approval:	November-2017

A- Basic Information

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**
Prerequisite:	COM 412 , MTH 312

Professional Information

1- Catalogue Course Description:

Introduction: uncertainty, information, entropy and its properties, Source coding: Shannon coding, prefix coding, Kraft-Mcmillan inequality, First Shannon theorem, Huffman coding, Lempel Ziv coding, Discrete memoryless channels: transition probability, binary symmetric channel, Mutual information and its properties, Channel capacity, Definition, Binary symmetric channel. Channel coding theorem: second Shannon theorem differential entropy and mutual information for continuous ensemples, Differential entropy, Mutual information, Channel capacity theorem: implications on different communication systems, Constant rate encoding, Linear encoding, Kraft rule for inequalities, Variable rate data compression Hofmann coding

Overall Aims of the Course:

At the end of the course, student should be able to

- ✓ Define information, entropy and its properties.
- ✓ Understand source coding theorem and data compression algorithm.
- ✓ Define mutual information related to capacity of communication channel.

- ✓ Understand Channel capacity theorem as the basis for reliable communication.
- ✓ Tradeoff between channel BW and SNR.

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a.1- Understand source and channel coding theorems
a.2- Understand information measures and entropy.

b- Intellectual Skills

By the end of this course the student should be able to:

b.1 –Apply mathematics to model communication system.
b.2.- Use simulation tools to source coding algorithms (MATLAB).
b.3 – Make tradeoff between, BW and SNR

c- Professional and Practical Skills

By the end of this course ,the student should be able to:

c1-Apply theories and techniques of mathematics to information measure and channel capacity.

C2 –Apply theories to find track off between BW and SNR.

C3c- Apply theories to source and channel coding algorithms.

d-General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team.
d2. Communicate effectively.
d3. Demonstrate efficient IT capabilities.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Information and entropy	6	4	10
2	Source coding theorem and coding algorithm	9	6	15
3	Discrete memoryless channels	6	4	10
4	Mutual information	6	4	10
5	Channel capacity	6	4	10
6	Channel coding theorem	6	4	10
7.	Capacity of continuous channel	6	4	10
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	MATLAB	Entropy
Experiment#2	MATLAB	Source coding algorithm

4- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment:

- Final exam:..40%
- Semester work:
  - In Class Quizzes and Participation 20%
  - Mid-Term Exams..30%
  - Assignment...10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

[1] Simon Haykin'Communication Systems' 4th Edition

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Prof. Dr. Ali Elmoghazy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	Spring 2017	

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

	Program ILOs													
	A03	A05	A13	A14	B01	B02	B03	B07	B08	C01	D01	D03	D04	D09
	Basics of information and communication technology	Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Theories, techniques, and technologies in the field of communication links including satellite, optical fibers, and mobile communication systems	Basic concepts of data transmission and data computer networks	Think in a creative and innovative way in problem solving and design	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems	Use software tools to develop computer programs for engineering applications	Perform the power budget computations for communication links and make the tradeoff between the power, bitrate, and bandwidth	Analyze and design communication systems based on the knowledge acquired	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Demonstrate efficient IT capabilities	Refer to relevant literatures
Course ILOs a1.														
a2.														
b1.														
b2.														
b3.														
c1.														
c2.														
c3.														
d1.														
d2.														
d3.														

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs										
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills		
	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3
Information and entropy	■	■	■	■		■	■		■	■	■
Source coding theorem and coding algorithm						■	■		■	■	■
Discrete memoryless channels						■	■				
Mutual information						■	■				
Channel capacity						■	■				
Channel coding theorem						■	■				
Capacity of continuous channel		■			■						

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs										
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills		
	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3
Lecture	■	■	■	■	■						
Tutorial	■	■	■	■	■						
Laboratory						■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs										
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills		
	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3
Written Exams	■	■	■	■	■						
Lab Report and Discussion						■	■	■	■	■	■
Relative weight %	40%		40%			10%			10%		

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Electrical Engineering Department

Course Specifications

COM 583: Wireless Communication Networks

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5^{rd} level
Date of specification approval:	November 2017

A- Basic Information

Title: Wireless Communication Networks **Code: COM 583**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: COM 412

B- Professional Information

1- Catalogue Course Description:

Introduction to wireless systems and standards: cellular and wireless systems, multiple access techniques, cellular system design considerations. Brief review of fundamentals of radio propagation and channel models; error probability and outage probability in fading channels. Signal modulation: modulation schemes used in mobile systems, spectral characteristics, and error performance. Introduction to diversity combining: antenna diversity, multipath diversity, interleaving. Selected topics on modern wireless systems, including ultra wideband (UWB) Wi-Fi and WiMax

Overall Aims of the Course:

- ✓ Provide students with a general understanding of the principles of modern cellular and wireless communication systems.
- ✓ Provide students with the most recent digital communications techniques in the broad field of modern wireless communications systems.
- ✓ Provide students with the necessary knowledge and skills to develop further understanding on the challenges and opportunities brought in designing current and future wireless communication systems and networks

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Have a Knowledge of contemporary wireless communications issues.

a2. Have a Conceptual understanding of the mathematics, statistics, and computer works.

a3. Design and conduct experiments, as well as to analyze and interpret data.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Apply knowledge of mathematics, science and engineering.

b2. Creative, innovative and pro-active demeanor.

b3. Professional use and management of information

b4. Fluent application of engineering techniques, tools and resources

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

c2. Understand of professional and ethical responsibility.

c3. Apply of systematic engineering synthesis and design processes

c4. Apply of established engineering methods to complex engineering problem solving.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Demonstrate efficient IT capabilities.

d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction to cellular and wireless system	3	2	5
2	Multiple Access Techniques	6	4	10
3	Wireless Channel Models	6	4	10
4	Digital Modulation Techniques over Wireless Channels	6	4	10
5	Multicarrier Modulation and OFDM	6	4	10
6	Diversity Techniques (Time, Frequency, Space, Multipath) over Wireless Channels	6	4	10
7	Channel Coding and Interleaving over Wireless Channels	6	4	10
8	Selected topics on modern wireless systems	6	4	10
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Computer Lab	Introduction to programming digital communications using Matlab
Experiment#2	Computer Lab	Simulation of digital communications system
Experiment#3	Computer Lab	Performance analysis of digital communications system

4- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:...40%
- Semester work:
  - In Class Quizzes and participations..............................20%
  - Mid-Term Exams..30%
  - Electronic and computer Lab Experiments 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- ✓ **Recommended book** (text books):
- ✓ Andreas F. Molisch, *Wireless Communications*, 2nd ed., Wiley, 2011.
- ✓ Theodore S. Rappaport, *Wireless Communications: Principles and Practice*. Prentice Hall, 2nd ed., 2002.
- ✓ Andrea Goldsmith, *Wireless Communications*. Cambridge University Press, 2005

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Computer Lab.

Course coordinator:		
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs								
		1	2	3	4	5	6	7	8	9
		Understand the basic principles of wireless communications	Compare the various types of multiple accessing schemes for wireless systems	Model pathloss in wireless channels	Analyze and compare the different digital modulation techniques	Describe the design and analyze the performance of multicarrier modulation (OFDM)	Describe the design and evaluate the performance of diversity techniques over wireless channels	Describe the design and analyze the performance of channel coding schemes for wireless systems	Describe several design issues and system parameters of existing	Develop simulations for the design and analysis of wireless systems using Matlab
Course ILOs	a1.	√	√	√	√	√	√	√	√	√
	a2.	√	√	√	√	√	√	√	√	√
	a3.		√	√	√					√
	b1.				√	√	√			√
	b2.			√						√
	b3.					√	√	√	√	√
	b4.					√	√	√		√
	c1.	√			√				√	√
	c2.		√	√	√			√		√
	c3.	√				√	√			√
	c4.	√		√	√			√	√	√
	d1.	√	√	√	√	√	√	√	√	√
	d2.								√	√
	d3.								√	√
	d4.	√	√	√	√	√	√	√	√	√

Table (2): Course Content/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding			Intellectual Skills				Practical Skills				General Skills			
Topic	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Introduction to cellular and wireless system	√	√	√	√	√			√			√	√	√		√
Multiple Access Techniques	√	√	√	√			√	√			√	√	√		√
Wireless Channel Models	√	√	√	√			√	√			√	√	√		√
Digital Modulation Techniques over Wireless Channels	√	√	√	√		√		√	√	√	√	√	√	√	√
Multicarrier Modulation and OFDM	√	√	√	√	√			√	√	√	√	√	√	√	√
Diversity Techniques (Time, Frequency, Space, Multipath) over Wireless Channels	√	√	√	√		√		√	√	√	√	√	√	√	√
Channel Coding and Interleaving over Wireless Channels	√	√	√	√			√	√	√	√	√	√	√		√
Selected topics on modern wireless systems	√	√	√	√	√			√			√	√	√		√

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding			Intellectual Skills				Practical Skills				General Skills			
Learning/Teaching Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecturing	√	√	√	√		√			√			√			
Discussion + Problem Solving	√	√	√		√		√	√		√	√				√
Laboratory	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding			Intellectual Skills				Practical Skills				General Skills			
Assessment Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	√	√	√	√	√	√	√	√	√			√			
Lab Report and Discussion		√	√	√	√		√	√	√	√	√	√	√	√	√
Relative weight %	30%			40%				20%				10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

COM 584: Interfacing Circuits and Networks

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5^{rd} level – 2^{nd} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Interfacing Circuits and Networks **Code: COM 584**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: COM 526

B- Professional Information

1- Catalogue Course Description:

Physical Layer : Properties of the Physical Layer, Movement of bits, Transmission Media Open Wire; Twisted Pair; Coaxial Cable; Optical Fiber. Link Layer, Role of the data link layer. Local Area Networks Definition of a Local Area Network, Ethernet , Network Interface Card , Medium Access Control Layer , Access to the Shared Medium (Cable), Transceiver Preamble, Carrier Sense Checking for other users; Possible contention. , Collision Detection (CD)Cabling (media) : 10B5 Thick Ethernet (low loss co-axial cable), 10B2 Thin Ethernet (low cost co-axial cable) , 10BT Unshielded Twisted Pair (unshielded twisted pair cable, UTP CAT-5) , 10BF Fiber Optic Links (point to point fiber link), Higher bandwidth twisted pair cable (CAT-5e, CAT-6, CAT-7, STP), Higher Speed Communication interfaces : Fast Ethernet100 Mbps, Gigabit Ethernet 1 Gbps, 10 Gbps, and higher.

Overall Aims of the Course:

- ✓ Provide students with a general understanding of the principles of computer communication networks.
- ✓ Provide students with the most recent digital communications techniques in the broad field of cables and protocols.

- ✓ Provide students with the necessary knowledge and skills to develop further understanding on the challenges and opportunities brought in designing current and future computer communications networks.

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Have a Knowledge of contemporary Network communications issues.

a2. Have a Conceptual understanding of the mathematics, statistics, and computer works.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Apply knowledge of mathematics, science and engineering.

b2. Creative, innovative and pro-active demeanor.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

c2. Apply of systematic engineering synthesis and design processes

c3. Apply of established engineering methods to complex engineering problem solving.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Demonstrate efficient IT capabilities.

d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction to networks	3	2	5
2	Network Protocols	6	4	10
3	Physical Layer	6	4	10
4	Transmission Media	6	4	10
5	Data Link Layer	6	4	10
6	Medium Access Control Layer	6	4	10
7	Local Area Networks	6	4	10
8	Selected topics on computer communication systems	6	4	10
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work

Activity	Facility	Title
Project #1	Computer Lab	Fundamentals of Networking Technologies
Project #2	Computer Lab	Networking hardware and software

4- Learning/Teaching Methods:
The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and participations.............................20%
  - Mid-Term Exams...30%
  - Electronic and computer Lab Experiments 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- ✓ **Recommended book** (text books):
- ✓ Computer Networking: A Top-Down Approach," by Jim Kurose and Keith Ross, 5th Edition

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Computer Lab.

Course coordinator:	Dr. Mohamed Mahalawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017 2017	

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		Program ILOs										
		A03	A14	B01	B02	C01	C02	C11	D01	D03	D04	D06
		Basics of information and communication technology	Basic concepts of data transmission and data computer networks	Think in a creative and innovative way in problem solving and design	Apply appropriate mathematical and physics knowledge for modelling and analysing electronic and communication systems problems	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems	Professionally merge the knowledge of electronic and communication systems to improve design, products and services.	Use the standard and appropriate tools to troubleshoot, maintain and repair the electronic systems	Collaborate effectively within multidisciplinary team	Communicate effectively	Demonstrate efficient IT capabilities	Effectively manage tasks, time, and resources.
Course ILOs	a1.	■										
	a2.		■									
	b1.				■							
	b2.			■								
	c1							■				
	c2						■					
	c3					■						
	d1								■			
	d2									■		
	d3										■	
	d4											■

Table (2): Course Content/Course ILOs Matrix

	Course ILOs										
	Knowledge & Understanding		Intellectual Skills		Practical Skills			General Skills			
Topic	a1	a2	b1	b2	c1	c2	c3	d1	d2	d3	d4
Introduction to networks	√	√	√	√	√			√	√		√
Network Protocols	√	√	√		√			√	√		√
Physical Layer	√	√	√		√			√	√		√
Transmission Media	√	√	√		√	√	√	√	√	√	√
Data Link Layer	√	√	√	√	√	√	√	√	√	√	√
Medium Access Control Layer	√	√	√		√	√	√	√	√	√	√
Local Area Networks	√	√	√		√	√	√	√	√		√
Selected topics on computer communication systems	√	√	√	√	√			√	√		√

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs										
	Knowledge & Understanding		Intellectual Skills		Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	b1	b2	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing	√	√	√			√		√			
Tutorial/Discussion	√	√		√	√		√				√
Laboratory	√	√	√	√	√	√	√	√	√	√	√

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs										
	Knowledge & Understanding		Intellectual Skills		Practical Skills			General Skills			
Assessment Method	a1	a2	b1	b2	c1	c2	c3	d1	d2	d3	d4
Written Exams	√	√	√	√	√	√					
Lab Report and Discussion		√	√	√	√	√	√	√	√	√	√
Relative weight %	30%		40%		20%			10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 213: Electronics

Program (s) on which the course is given:	B.Sc. in Electrical Power Engineering, and B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	2^{nd} level – 4^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electronics **Code: ELE 213**

Credit Hours: **4 Cr. Hrs.**
Lecture: **3 Hrs. /week**
Tutorial/Lab: **3 Hrs. /week**
Total: **6 Hrs. /week**
Prerequisite: PHY 232 (Solid State Physics),
Co-requisite: EPR 261 (Electrical Circuits 1).

B- Professional Information

1- Catalogue Course Description:
Semiconductor diode (theory of the P-N junction, I-V characteristics, junction potential, forward and reverse biased P-N junction, diffusion capacitance), Diode models. Diode circuit applications (rectifier circuits, voltage doublers, clipping circuits), Special diodes: Zener diode, Schottky barrier diodes, Light emitting diodes (LED), and photodiodes. Bipolar Junction Transistor (BJT), Static and dynamics characteristics, Field Effect Transistor (FET), linear, nonlinear and pinch off regions, Junction Field Effect Transistor (JFET) and Metal Oxide Semiconductor Field Effect Transistor (MOSFET): physical structure, basic configurations, the I-V characteristics, FETs applications: MOSFET as a resistance, JFET as a constant current source, Single stage amplifiers (biasing, small signal models). Other semiconductor devices.

2- Overall Aims of the Course:

- ✓ Describe the physical and basic principles of semiconductor diodes, BJT, and FET.
- ✓ Analysis of diode circuits and their different applications.
- ✓ Understand the analysis of single-stage amplifier circuits using FET & BJT.
- ✓ Train the student to perform experiments on electronic circuits using electronic laboratory

and software tools for circuit design and simulation.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

a1. Describe the basic principles of semiconductor diodes.

a2. Determine the different applications of the diode circuits.

a3. Recognize the basic principles of semiconductor FET transistors.

a4. Describe the single-stage amplifier circuits using FET transistors and their applications.

a5. Define the basic principles of semiconductor BJT transistors.

a6. Describe the single-stage amplifier circuits using BJT transistors and their applications.

b- Intellectual Skills

b1. Analyze problems related to the diode circuits and their different applications.

b2. Analyze problems related to single-stage amplifier circuits and their applications.

b3. Construct a comparison between different configurations of single-stage amplifier circuits.

c- Professional and Practical Skills

c1. Apply theories and techniques of mathematics, basic electricity and electronics to solve electronic circuit problem.

c2. Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments.

c3. Read thoroughly datasheets and identify appropriate specifications for required device and circuits.

d- General and Transferable Skills:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction to Electronics and Semiconductors	3	3	6
2	Physics of semiconductors	6	3	9
3	PN-junction • Ideal diode and actual Diode Characteristics.	3	3	6
4	Different applications of diodes: Rectifier circuits, Peak detectors, Limiter and clamper circuits, voltage doublers, Zener Diodes, and Special diodes	9	12	21
5	Amplification using FET transistors • Biasing techniques • Common Source Amplifier • Common Drain Amplifier • Common Gate Amplifier	9	9	18
6	Different applications of FET transistors	3	3	6
7	Amplification using BJT transistors • Biasing techniques • Common Emitter Amplifier • Common Collector Amplifier • Common Base Amplifier	6	6	12
8	Different applications of BJT transistors	6	6	12
Total		**45**	**45**	**90**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Electronics Lab	Establishing and Displaying Characteristics in AC Technology
Experiment#2	Electronics Lab	Applications of diodes
Experiment#3	Electronics Lab	Light Emitting and Zener Diodes.
Experiment#4	Electronics Lab	Single-stage amplifier circuits.
Experiment#5	Computer Lab	Applications of diodes
Experiment#6	Computer Lab	Single-stage amplifier circuits.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and participations..........20%
  - Mid-Term Exams..........30%
  - Electronic and computer Lab Experiments 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

- ✓ **Recommended book** (text books): Adel S. Sedra, and Kenneth C. Smith, *Microelectronic Circuits*, Oxford University Press 7th Edition, 2014.
- ✓ **Essential book** (text books): Albert Malvino. David Bates, Electronic Principles, Eighth Edition, Mc Graw Hill Education, 2016.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Associate Prof. Dr. Mohamed H. El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs Electronic & Communication										
		A07	B01	B03	B11	C01	C04	C12	D01	D03	D06	D07
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits	Think in a creative and innovative way in problem solving and design	Use software tools to develop computer programs for engineering applications.	Assess and evaluate the characteristics and performance of electronic components, systems and processes	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.											
	a2.											
	a3.											
	a4.											
	a5.											
	a6.											
	b1.											
	b2.											
	b3.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											
	d3.											
	d4.											

		Program ILOs Electric Power								
		A11	B02	B03	C01	C03	D01	D03	D06	D07
		Fundamentals of electrical engineering including DC/AC electrical circuits, electronic circuits, electronic devices and circuits, electromagnetic fields, and electrical and electronic instrumentation	Develop and implement simple computer programs for engineering applications	Think in a creative and innovative way in problem solving and design.	Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a7.									
	a8.									
	a9.									
	a10.									
	a11.									
	a12.									
	b1.									
	b2.									
	b3.									
	c1.									
	c2.									
	c3.									
	d5.									
	d6.									
	d7.									
	d8.									

Table (2): Course Content/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Introduction to Electronics and Semiconductors																
Physics of semiconductors																
PN-junction • Ideal diode and actual Diode Characteristics • Ideal diode and actual Diode Characteristics																
Different applications of diodes: Rectifier circuits, Peak detectors, Limiter and clamper circuits, voltage doublers, Zener Diodes, and Special diodes																
Amplification using FET transistors • Biasing techniques • Common Source Amplifier • Common Drain Amplifier • Common Gate Amplifier																
Different applications of FET transistors																
Amplification using BJT transistors • Biasing techniques • Common Emitter Amplifier • Common Collector Amplifier • Common Base Amplifier																
Different applications of BJT transistors																

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing																
Problem solving																
Discussion																
Experiential Learning																

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Written Exams																
Lab Report and Discussion																
Relative weight %	30%						40%			20%			10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 215: Logic Design and Digital Circuits

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering and B.Sc in Electrical Power Engineering.
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	2nd level – 4th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Logic Design and Digital Circuits **Code: ELE 215**

Credit Hours: **3 Cr. Hrs.**
Lecture: **3 Hrs. /week**
Tutorial/Lab: **2 Hrs. /week**
Total: **5 Hrs. /week**
Co-requisites: ELE 213 Electronics.

B- Professional Information

1- Catalogue Course Description:
Review on number systems: positional notation, binary number systems, number base conversion, octal and hexadecimal, negative numbers, coded number systems, Switching functions: main operators, postulates and theorems, Analysis and synthesis of switching functions, incompletely specified functions, Design using NAND and NOR gates, standard combinational Logic, PLA & PAL implementation of combinational logic, Storage devices: 1-bit storage, set-reset FF, clocked SR-FF, positive and negative-edge triggered SR-FF, JK-FF, Race-around condition, Master-slave JK-FF, D-FF, T-FF, Excitation table. Introduction to sequential circuits and FSM.

Overall Aims of the Course:

- ✓ Understand and use different number systems and coding schemes.
- ✓ Analyze and design combinational logic based on minimizing Boolean functions.
- ✓ Analyze and design flip flops and get deeply involved with sequential circuits (especially synchronous).
- ✓ Train students to perform experiments on digital circuits using software tools for circuit logic design and simulation.

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Explain different number systems: positional notation, binary number systems, number base conversion, octal and hexadecimal, negative numbers, coded number systems.

a2. Explain switching functions: main operators, postulates and theorems.

a3. Explain analysis and design of combinational circuits and their applications.

a4. Explain analysis and design of sequential circuits and their applications.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Solve problems related to different number systems and its different applications.

b2. Solve problems related to different combinational circuits and their different applications.

b3. Solve problems related to different sequential circuits and their different applications.

b4. Design digital circuits using professional software tools.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Clarify theories and techniques of mathematics to solve digital circuit problems.

c2. Build the components and requirements for designing a complete digital circuit.

c3. Develop the design and implementation of digital circuits using software tools and measuring instruments.

c4. Seek thoroughly datasheets and identify appropriate specifications for required digital circuits either combinational circuits or sequential circuits.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Number systems and coding systems	6	4	10
2	Switching functions: main operators, postulates and theorems.	6	4	10
3	Analysis and synthesis of switching functions	6	4	10
4	Analysis of Combinational circuits.	6	4	10
5	Design of Combinational circuits.	6	4	10
6	Asynchronous sequential circuits	3	2	5
7	Analysis of Synchronous sequential circuits.	6	4	10
8	Design of Synchronous sequential circuits, registers	6	4	10
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Electronics Lab	Some applications of basic logic gates
Experiment#2	Electronics Lab	Applications of finite state machine
Experiment#3	Computer Lab	Applications of finite state machine

4- Learning/Teaching Methods:
The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and participations..........20%
  - Mid-Term Exams..........30%
  - Electronic and computer Lab Experiments..........10%
- **Total..100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

- ✓ **Recommended book (text books)**: M. Morris Mano, and Michael D. Ciletti; "Digital Design with an Introduction to the Verilog HDL"; 5th Edition; Pearson; 2013.

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Associate Prof. Dr. Mohamed H. El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs									
		A10	B01	B10	C01	C04	C12	D01	D03	D06	D07
		Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Think in a creative and innovative way in problem solving and design.	Design and integrate digital systems for certain specific function using the appropriate components.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.										
	a2.										
	a3.										
	a4.										
	b1.										
	b2.										
	b3.										
	b4.										
	c1.										
	c2.										
	c3.										
	c4.										
	d1.										
	d2.										
	d3.										
	d4.										

Course ILOs	Program ILOs Electric Power: A10 – Principles, theories and techniques in the field of logic circuit design, digital circuits and systems, computer organization, microprocessors and	B02 – Think in a creative and innovative way in problem solving and design.	B06 – Analyze and design logic circuits, digital circuits, computer and microprocessor systems and PLC's.	C01 – Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	C03 – Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	D01 – Collaborate effectively within multidisciplinary team.	D03 – Communicate effectively.	D06 – Effectively manage tasks, time, and resources	D07 – Search for information and engage in life-long self-learning discipline
a5.	■								
a6.	■								
a7.	■								
a8.	■								
b1.			■						
b2.			■						
b3.		■	■						
b4.		■	■						
c1.				■					
c2.				■	■				
c3.					■				
c4.									
d5.						■			
d6.							■		
d7.								■	
d8.									■

Table (2): Course Content/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding				Intellectual Skills				Practical Skills				General Skills			
Topic	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Number systems and coding systems	■				■											
Switching functions: main operators, postulates and theorems.		■				■			■							
Analysis and synthesis of switching functions		■				■			■							
Analysis of Combinational circuits.			■			■			■			■				
Design of Combinational circuits.			■			■		■		■	■	■	■	■	■	■
Asynchronous sequential circuits				■			■									
Analysis of Synchronous sequential circuits.				■			■					■				
Design of Synchronous sequential circuits, registers				■			■	■		■	■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding				Intellectual Skills				Practical Skills				General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■	■	■								
Discussion					■	■	■							■		
Problem Solving					■	■	■	■								
Experimental Learning											■			■	■	
Cooperative Learning													■			
Research																■
Site Visit (Field Trip)			■	■								■				
Project/Assignment				■				■	■	■					■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding			Intellectual Skills				Practical Skills				General Skills			
Assessment Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams															
Lab Report and Discussion															
Relative weight %	40%			40%				10%				10%			

جـــــامـــــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 364: Electronic Circuits

Program (s) on which the course is given:	B.Sc. in Electrical Power Engineering, and B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	3rd level – 5th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electronic Circuits **Code: ELE 364**

Credit Hours:	**4 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**3 Hrs. /week**
Total:	**6 Hrs. /week**

Prerequisite: ELE 213 Electronics.

B- Professional Information

1- Catalogue Course Description:
Transistor small signal models: π- model , Analysis of audio frequency (AF) amplifiers: RC-coupled, high frequency model and frequency response, AF power amplifiers: Class-A, Push-pull operation (Class-A, Class-B, Class AB), Feedback amplifiers (FB): FB concept, stability, general characteristics of negative FB amplifiers, input and output impedances with FB, difference amplifier Operational amplifiers (OPAMPs):, OPAMP specifications and frequency characteristics, OPAMP applications: inverting, non-inverting, adder, subtracter, integrator, differentiator, Oscillators: concept of stability and oscillations, OPAMP oscillators (rectangular, sinusoidal, Wien bridge, phase shift, and tuned circuits). Multivibrators (MVs): bistable MVs, triggering, schmitt trigger, monostable and astable MVs, wave shaping circuits and the 555 timer.

2- Overall Aims of the Course:

- ✓ Understand the principles of circuit design and its applications.
- ✓ Analyze the performance and implement electronic circuits.
- ✓ Train student to perform experiments on electronic circuits using software tools for circuit design and simulation.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Describe the AF amplifiers and their frequency response.

a2. List the various power amplifier circuits.

a3. Recognize the design of the OPAMP amplifier circuits and their applications.

a4. Recognize the multi-stage amplifiers including differential amplifier circuits.

a5. Define the feedback circuits and their amplifiers.

a6. Determine the various applications of oscillators.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Analyze problems of amplifier circuits (OPAMP amplifiers, power amplifiers, multi-stage amplifiers, and feedback amplifiers) and search for optimized solutions.

b2. Use professional software tools for design and implementing of electronic circuits.

b3. Prepare a technical design report on an assignment.

b4. Design of electronic circuits for engineering applications.

b5. Assess and evaluate the characteristics and performance of electronic circuits.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Apply theories and techniques of mathematics, basic electricity and electronics to solve electronic circuit problem.

c2. Identify the components and requirements for designing a complete application circuit.

c3. Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments.

c4. Read thoroughly datasheets and identify appropriate specifications for required device and circuits.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Frequency response of the single stage amplifier	3	6	9
2	Power Amplifiers	6	6	12
3	OPAMP amplifier and the first Mid-term	9	12	21
4	Differential Amplifiers	6	6	12
5	Multistage Amplifiers	6	6	12
6	Feedback Amplifier and the second Mid-term	9	6	15
7	Oscillator and Multivibrator	6	3	9
	Total	**45**	**45**	**90**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Electronics Lab	OPAMP applications: Inverting & non-inverting amplifiers
Experiment#2	Electronics Lab	OPAMP applications: the weighted summer, voltage follower and difference amplifiers.
Experiment#3	Electronics Lab	OPAMP applications: the integrator and differentiator.
Experiment#4	Electronics Lab	Power amplifier circuits: Class A, Class B, Class AB.
Experiment#5	Electronics Lab	Multi stage amplifier circuit and feedback circuits.
Experiment#6	Electronics Lab	Signal generators and Oscillators.
Experiment#7	Electronics Lab	Multivibrators and IC 555 application circuits.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:...40%
- Semester work:
  - In Class Quizzes and participations..........20%
  - Mid-Term Exams..........30%
  - Lab Experiments & Project..........10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

Essential books (text books): Adel S. Sedra, and Kenneth C. Smith, "*Microelectronic Circuits*", Oxford University Press 6th edition, 2011.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Power System Lab.

Course coordinator:	Associate Prof. Dr. Mohamed H. El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs												
		A07	B01	B03	B04	B11	C01	C03	C04	C12	D01	D03	D06	D07
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits	Think in a creative and innovative way in problem solving and design	Use software tools to develop computer programs for engineering applications.	Write a technical report on a project or an assignment	Assess and evaluate the characteristics and performance of electronic components, systems and processes	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Design a process, component or system and practice the quality of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.	■												
	a2.	■												
	a3.	■												
	a4.	■												
	a5.	■												
	a6.	■												
	b1.		■											
	b2.			■										
	b3.				■									
	b4.		■											
	b5.					■								
	c1.						■							
	c2.							■						
	c3.								■					
	c4.									■				
	d1.										■			
	d2.											■		
	d3.												■	
	d4.													■

Table (2): Course Content/Course ILOs Matrix

	Course ILOs																		
	Knowledge & Understanding						Intellectual Skills					Practical Skills				General Skills			
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Frequency response of the single stage amplifier	■						■	■			■	■							
Power Amplifiers		■					■	■		■	■	■		■	■				■
OPAMP amplifier			■				■	■	■	■	■	■	■	■	■	■	■	■	■
Differential Amplifiers				■			■	■		■	■	■		■					
Multistage Amplifiers				■			■	■		■	■	■		■					
Feedback Amplifier					■		■	■	■	■	■	■	■	■					
Oscillator and Multivibrator						■		■			■	■		■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																		
	Knowledge & Understanding						Intellectual Skills					Practical Skills				General Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■	■	■	■	■	■	■								
Problem solving							■	■	■	■	■								
Discussion	■	■	■	■	■	■	■	■	■	■	■						■		
Experiential Learning												■	■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																		
	Knowledge & Understanding						Intellectual Skills					Practical Skills				General Skills			
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■	■	■	■							
Lab Report and Discussion													■	■	■	■	■	■	■
Relative weight %	30%						40%					20%				10%			

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 412: Optical Electronics

Program(s) on which the course is given:	B.Sc. in Electronics and Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	Level 4 –8th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Optical Electronics **Code: ELE 412**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: Solid State Physics - PHY 232

Professional Information

1- Catalogue Course Description:

Introduction, Photons & Electrons. Maxwell's equations, Wave nature of light, Fundamentals of Optics. Interaction of radiation and atomic systems, particle/wave property, De-Broglie wave length, Uncertainty principle, Optical Coherence and Correlation. Radiation and Solids: Light and matter (light propagation in uniform dielectric medium, Rayleigh scattering, susceptibility, optical dispersion), rate equations and gain medium for two level system. Theory of laser oscillation: Fabry-Perot laser, Three-level System. Four-level System. Optical Sources- Gas Laser, Nd-YAG Laser, Semiconductor sources (LEDs & LDs). Optical Modulators. Photo detectors (PINs & APDs).

2- Overall Aims of the Course:

- ✓ Understand the principles of operation of photonic components.
- ✓ Develop the students' knowledge about optical and photonic components.
- ✓ Prepare students to analyze the photonic components.
- ✓ Perform the basic calculations of optical sources and optical detectors.
- ✓ Train students to perform basic experiments on optical and photonic components.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Review the main concepts of geometrical optics and Quantum theory.
a2. Recognize the theory of semiconductor materials and their optical properties.
a3. Explain the operating principles of LEDs, Lasers, SLDs, and optical detectors.
a4. Review knowledge and understanding optical and photonic devices.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Analyze the main parameters related optical and photonic components.
b2. Examine the basic parameters of photonic devices.
b3. Compare of the different types of the used optical sources and detectors in optical fiber communications.

c- Professional and Practical Skills

By the end of this course, the student should be able to:

c1. Follow-up safety requirements at work.

c2. Edit and present a professional technical report.

c3. Interpret carefully the data sheets of optical and photonic devices.

c4. Build-up experimental set-up to test the basic parameters of the optical component and photonic devices.

d-General and Transferable Skills:

By the end of this course the student should be able to:

d1. Demonstrate a self-directed manner.

d2. Show the ability to work coherently and successfully as a part of a team.

d3. Manage time and meet deadlines.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction, Photons & Electrons. Maxwell's equations, Wave nature light, Emission of and Absorption processes.	3	2	5
2	Fundamentals of Optics, Ray optics: reflection, refraction, critical and Brewster angles. Interference of light, Interferometers, Diffraction and Polarization.	6	4	10

3	Light and matter: Emission, Propagation and Absorption Processes.	6	4	10
4	Optical Coherence and Correlation: Definition, Measurement of coherence and Practical examples.	3	2	5
5	Essential Physics of Radiation and Solids: Black body radiation, Classical results and Quantum results. Rate Equations and the Gain mechanism. Laser Structure, Mode locking and Q switching.	6	4	10
6	Electrons in solids: Laser sources (He=Ne Laser, Argon Laser and ND-YAG Laser), SC sources (LEDs and SLDs)	6	4	10
7	Optical Modulators: Internal modulation, External modulators: Electro optic, Magneto optic and Acousto-optic modulator.	6	4	10
8	Photo detectors: photo-emissive, photoconductive and photovoltaic detectors.	3	2	5
9	Testing of the basic characteristics of optical sources, detectors, and optical components.	3	2	5
10	Assignments Presentation and discussions.	3	2	5
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	O.F.C. Lab.	LED characteristic
Experiment#2	O.F.C. Lab.	FSR of a laser diode
Experiment#3	O.F.C. Lab.	Polarization
Experiment#4	O.F.C. Lab.	Optical components: Couplers, Isolators, WDM
Experiment#5	O.F.C. Lab.	Detectors

6- Learning/Teaching Methods:

- Interactive Lecturing and Discussions.
- Problem Solving.
- Experiential Learning.
- Project and Presentation.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment:

- Final exam :..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes and Homework........................10%
  - Assignments and Course Project........................15%
  - Lab test..5%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

Text Book:

1. Alan Rogers, "Essentials of Photonics" Second Edition, CRC Press,2009. Text book.

References:

2. "Fundamentals of Photonics" Bahaa E. A. Saleh, Malvin Carl Teich.

9- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- University Library.
- O.F.C. Lab.
-

Course coordinator:	Prof. Dr. Kamel Hasan	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): The course ILOs are mapped to the program ILOs.

		Program ILOs												
		A01	A07	A08	B02	B11	B15	C07	C10	C12	C13	D01	D03	D06
		Basic Sciences including classical and solid state physics, mechanics and chemistry.	Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Principles and applications of photonics.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Analyze the performance of Photonic devices and systems	Follow up safety requirements at work and observe the appropriate steps to manage risks.	Edit and present technical report.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Perform the practical measurements of the photonic devices and systems.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a1.	■												
	a2.		■											
	a3.		■											
	a4.		■	■										
	b1.				■									
	b2.					■								
	b3.					■	■							
	c1.							■						
	c2.								■					
	c3.									■				
	c4										■			
	d1.											■		
	d2.												■	
	d3.													■

Table (2): The course contents are mapped to the course ILOs.

	Course ILOs													
	Knowledge and understanding				Intellectual Skills			Professional and practical skills				General and transferable skills		
Topic	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3
Introduction, Photons & Electrons	■													
Fundamentals of Optics	■													
Light and Matter		■	■											
Optical Coherence and Correlation			■											
Essential Physics of Radiation and Solids	■		■											
Electrons in Solids	■			■										
Semiconductor Materials and their Optical Properties. LEDs and SLDs		■	■		■	■	■	■	■	■	■			
Optical Modulators				■	■	■		■	■	■	■			■
Photodetectors		■	■		■	■	■	■	■	■	■			■
Assignments, Presentation and Discussion	■	■	■	■								■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge and understanding					Intellectual Skills					Professional and practical skills				General and transferable skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■	■	■	■	■								
Discussion	■	■	■	■	■	■	■	■	■	■								
Problem Solving						■	■	■	■	■								
Experimental Learning											■	■	■					
Cooperative Learning											■	■	■	■	■	■	■	■
Research						■	■	■	■	■					■	■	■	■
Project											■	■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																		
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Assessment Method	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Written Exams																		
Reports and Discussion																		
Lab work and Project																		
Relative weight %	30 %				50 %					15%					5 %			

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 415: Analog Signal Processing

Program (s) on which the course is given:	B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	4^{th} level – 7^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Analog Signal Processing **Code: ELE 415**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 364 Electronic Circuits

B- Professional Information

1- Catalogue Course Description:

Op-Amp analog signal processing: Active Filters, voltage multiplier/divider, logarithmic and exponential amplifiers, inductance simulation, comparators & window comparators, switched capacitor filters, voltage multiplier (Gilbert Cell), voltage regulators, phase detectors, VCO, F/V & V/F converters, PLL and synthesizers. FM & PM detection using PLL.

2- Overall Aims of the Course:

- ✓ Develop the students' knowledge about analog filters.
- ✓ Prepare students to analyze, design and implement analog filters.
- ✓ Develop students' knowledge about voltage and frequency multipliers.
- ✓ Develop students' knowledge about Phase Locked Loop.
- ✓ Train students to perform experiments on electronic communication systems.

3- Intended Learning Outcomes (ILOs)of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Explain the signal processing theories and techniques of the analog filter design.
a2. Explain the theories and techniques of the analog multiplier design and implementation.
a3. Explain the theories and techniques of the voltage controlled oscillator & PLL design and implementation and its applications in communication systems.
a4. Define different techniques of the data conversion systems.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Apply mathematical background for modelling and analyzing the analog filter characteristics.
b2. Design the analog filter in an appropriate way.
b3. Use software tools to design analog filters.
b4. Evaluate the performance of voltage multipliers with their applications in communication systems.
b5. Apply different theories and techniques of electronics and digital signal processing to design the voltage controlled oscillator & Phase Locked Loop.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Build the appropriate analog filters based on techniques of analog filter design.
c2. Develop the analog filter design using software tools.
c3. Formulate the knowledge of communication systems and electronics to design and implement analog multipliers.
c4. Build the appropriate component to design the required communication system.
c5. Develop a technical report of an assignment and project.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team.
d2. Communicate effectively.
d3. Effectively manage tasks, time, and resources.
d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Review on electronic circuits	3	2	5
2	Analog filters	6	4	10
3	Active Filters 1	6	4	10
4	Active Filters 2	6	4	10
5	Analog Multipliers 1 (voltage & Frequency)	6	4	10
6	Analog Multipliers 2 (voltage & Frequency)	6	4	10
7	Voltage Oscillators	6	4	10
8	Phase Locked Loop	3	2	5
9	Data conversion	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Electronics Lab	RC active filters & RLC filters
Experiment#2	Electronics Lab	Voltage oscillators
Experiment#3	Electronics Lab	PLL system
Project	Communication Lab	Design & implement PLL system.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes..20%
  - Mid-Term Exams..30%
  - Lab Experiments & Project..10%
- **Total...100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

Course notes: Instructor notes**.**

Essential books (text books)

- Adel S. Sedra, and Kenneth C. Smith, "*Microelectronic Circuits*", Oxford University Press, 6th edition, 2011.
- B. P. Lath, "Modern analog and digital communication systems", Oxford University Press, 1998.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronics Lab. and Communication Lab.

Course coordinator:	Dr. Omar Mamdouh Fahmy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

Course ILOs	Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Theories, techniques, analysis of analog and digital signals processing.	Think in a creative and innovative way in problem solving and design.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Use software tools to develop computer programs for engineering applications.	Analyze and design communication systems based on the knowledge acquired.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Design a process, component or system and practice the neatness and aesthetics of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data analyze and interpret results.	Edit and present technical report.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
	A05	A07	A12	B01	B02	B03	B08	C01	C03	C04	C10	C12	D01	D03	D06	D07
a1																
a2																
a3																
a4																
b1																
b2																
b3																
b4																
b5																
c1																
c2																
c3																
c4																
c5																
d1																
d2																
d3																
d4																

Table (2): Course Contents/Course ILOs Matrix

Course Contents	Course ILOs																	
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Topic	a 1	a 2	a 3	a 4	b 1	b 2	b 3	b 4	b 5	c 1	c 2	c 3	c 4	c 5	d 1	d 2	d 3	d 4
Review on electronic circuits																		
Analog filters																		
Active Filters 1																		
Active Filters 2																		
Analog Multipliers 1 (voltage & Frequency)																		
Analog Multipliers 2 (voltage & Frequency)																		
Voltage Oscillators																		
Phase Locked Loop																		
Data conversion																		

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Interactive Lecture																		
Discussion																		
Problem Solving																		
Experimental Learning																		
Cooperative Learning																		
Project																		

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																	
Learning/Teaching Method	Knowledge & Understanding				Intellectual Skills					Practical Skills					General Skills			
Topic	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4
Written Exams																		
Lab & Project																		
Relative weight %	40%				40%					10%					10%			

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 420: Electronic Devices

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2014/2015	4^{th} year – 7^{th} semester
Date of specification approval:	November 2017

A-Basic Information

Title: Electronic Devices **Code: ELE 420**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: **EPR 364 Electronic Circuits.**

A- Professional Information

1- Catalogue Course Description:

Crystal Structure and Reciprocal Lattice, Energy Bands, Carrier Concentration at Thermal Equilibrium, Generation, Recombination, and Carrier Lifetimes, Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, Diffusion Basic Equations and Examples PN Junction and Depletion region I-V characteristics, and Non-ideal Effects, PSpice Models for PN Junctions Silicon MOS Capacitor, MOSFET Characteristics and Behavior, MOSFET PSpice model, BJT PSpice model.

Overall aims of course

This course aims to:

- ✓ Improve student's foundational background, theories and mechanism of operation of principle semiconductor devices with emphasis on physical concepts.
- ✓ Develop the student skills in modeling and characterization of semiconductor devices.
- ✓ Improve students understanding of the link between device physics and circuit design by introducing design parameters, performance parameters, CAD models, device scaling theory, etc.

2- Intended learning outcomes of course (ILOs):

a. Knowledge and understanding:

a1- Explain mechanisms of principle operation of semiconductor devices.
a2- Explain physical phenomena and implications of downscaling of semiconductor devices.
a3- Define compact models for circuit simulation.

b. Intellectual skills:

b1- Develop analytical models for semiconductor devices.
b2- Use compact device models for circuit simulation.
b3- Use semiconductor devices for material and process characterization.

c. Professional and practical skills:

c1- Build practical circuit simulation using compact device models.
c2- Develop technical report writing skills.

d. General and transferable skills:

d1- Solve analytical Problem.
d2- Develop ideas and share with others.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Crystal Structure and Reciprocal Lattice	3	2	5
2	Energy Bands	3	2	5
3	Carrier Concentration at Thermal Equilibrium ,	3	2	5
4	Generation, Recombination, and Carrier Lifetimes	3	2	5
5	Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, Diffusion	6	4	10
6	PN Junction and Depletion region I-V characteristics	9	6	15
7	Silicon MOS Capacitor	9	6	15
8	MOSFET Characteristics and Behavior,	6	4	10
9	MOSFET Pspice model	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Teaching and learning methods:

4.1- Lectures
4.2- Tutorials
4.3- Laboratories

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Student Assessment Methods:

- **5.1- Mid Term Exam** to assess the skills of problem solving, understanding of related topics.
- **5.2- Project** or technical report to access: the ability to apply knowledge gained in the course in a real design case.
- **5.3- Final Written exam** to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.

• Final exam :	40%
• Semester work:	
o In Class Quizzes and Participations	20%
o Mid-Term Exams	30%
o Report or project	10%
• Total	100%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references

a. **Course notes:** Taken by the student inside classroom.

b. **Essential books (text books):** Streetman, S. Banerjee, "Solid State Electronic Devices", Prentice-Hall, 2005.

c. **Recommended books:**
-S.M. Sze, “Semiconductor Devices: Physics and Technology”, J. Wiley, 2001.
-R.F. Pierret. “Semiconductor Device Fundamentals”, Prentice-Hall, 1995.
-Edward Yang, “Microelectronics Devices”, McGraw Hill, 1988.

d. **Periodicals, Web sites, … etc**
-N.A.

7- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.
- Electronics lab.

Course coordinator: **Dr. Ahmed Saeed**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: November 2017

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs: A7 – Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	A16 – Analysis, techniques and applications of digital integrated circuits and nanotechnology.	B2 – Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	B11 – Assess and evaluate the characteristics and performance of electronic components, systems and processes.	C5 – Apply numerical modeling methods to microwave, antennas, electronic and communication systems.	C10 – Edit and present technical report.	D1 – Collaborate effectively within multidisciplinary team.	D3 – Communicate effectively.	D6 – Effectively manage tasks, time, and resources.	D7 – Search for information and engage in life-long self-learning discipline.	D9 – Refer to relevant literatures.
a1.	■										
a2.		■									
a3.	■										
b1.				■							
b2.			■								
b3.			■								
c1.					■						
c2.						■					
d1.										■	■
d2.							■	■	■		

Table (2): Course contents /Course ILOs Matrix

	Course ILOs									
	Knowledge & Understanding			Intellectual Skills			Practical Skills		General Skills	
Topic	a1	a2	a3	b1	b2	b3	c1	c2	d1	d2
Crystal Structure and Reciprocal Lattice	■								■	
Energy Bands	■								■	
Carrier Concentration at Thermal Equilibrium.	■								■	
Generation, Recombination, and Carrier Lifetimes.	■					■			■	
Carrier Transport Phenomena, Drift, High Field Transport, Impact Ionization, Diffusion	■					■			■	
PN Junction and Depletion region I-V characteristics	■		■	■			■		■	■
Silicon MOS Capacitor	■							■	■	■
MOSFET Characteristics and Behavior.	■	■							■	
MOSFET Pspice model		■	■	■	■		■		■	

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs									
	Knowledge & Understanding			Intellectual Skills			Practical Skills		General Skills	
Learning/Teaching Method	a1	a2	a3	b1	b2	b3	c1	c2	d1	d2
Interactive Lecture	■	■	■	■						
Discussion			■	■	■					■
Problem Solving				■	■	■				
Experimental Learning							■			
Research									■	
Site Visit (Field Trip)			■					■		
Project/Assignment			■	■	■	■		■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs									
	Knowledge & Understanding			Intellectual Skills			Practical Skills		General Skills	
Assessment Method	a1	a2	a3	b1	b2	b3	c1	c2	d1	d2
Written Exams	■	■	■	■	■	■			■	
Lab Report and Discussion							■	■		■
Relative weight %	30%			40%			20%		10%	

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 511: Radio Frequency Microelectronics

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2015/2016	5th year – 10th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Radio Frequency Microelectronics **Code: ELE 511**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial/Lab: 2 Hrs.
Total: 5 Hrs.
Prerequisite: ELE 420 Electronic Devices , COM 411 Communication 1

B- Professional Information

1- Catalog Course Description

The theory and practice of Radio Frequency (RF) engineering, Transmission lines, and scattering parameters, Design of RF components (low noise amplifiers, power amplifiers, oscillators, RF power detectors, active/passive mixers, power amplifiers), Properties and representation of noise, Passive device design (micro strip lines, diodes, IC resistors, IC capacitors, and IC inductors), Active device design (bipolar and FET's).

2- Overall aims of course

The overall aims of the course are

- Prepare students to model the passive components in the RF frequency range.
- Develop students' skills to analyze and design RF power amplifiers .

- Train students to analyze Low Noise amplifiers .
- Train students to determine the Model parameters of radio frequency transistors.

3- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding

By completing this course successfully, the student will be able to:

a1- List the operation of common transceiver architectures for RF transmission and reception.
a2- Explain the concept of noise figure, non-linearity, blockers, and sensitivity in RF transceivers
a3- Asses the performance requirements of different building blocks of RF transceivers such as noise figure, gain and non-linearity.
a4- Describe the concept of impedance matching and impedance transformation in RF circuits
a5- Recognize low noise amplifiers, mixers, voltage controlled oscillators, power amplifiers, and phase locked loops.

b. Intellectual skills

By completing this course successfully, the student will be able to:

b1- Think intuitively about RF transceivers and its building blocks.
b2- Analyze system requirements of RF transceivers.

c. Professional and practical skills

By completing this course successfully, the student will be able to:

c1- Perform analysis of RF transceivers and its building blocks.
c2- Use software tools to evaluate the different RF building blocks.
c3- Prepare technical report.

d. General and transferable skills

By completing this course successfully, the student will be able to:

d1- Work in teams.
d2- Propose and formulate new ideas.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Contents

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Basic Concepts in RF Design.	6	4	10
2	RF Passive Components.	3	2	5
3	Transmission lines and scattering parameters.	6	6	15
4	Active RF Components.	6	4	10
5	RF Power amplifiers.	12	4	10
6	LNA amplifiers and Mixers.	6	2	5
7	Oscillators.	3	4	10
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Teaching and learning methods:
See Appendix, table [3]

5- Student Assessment Methods:

Final exam : -- 40%

Semester work:

In Class Quizzes -- 10%

2Midterms -- 30%

Performance/assignments -- 20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

6- Assessment schedule

Assessment 1	First Mid-Term Exam	Week 7
Assessment 2	Second Mid-Term Exam	Week 11
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 15

7- List of references

a. Essential books (text books)

- R. Ludwig, RF Circuit Design Theory and Applications, Prentice Hall, 2000, USA.

b. Recommended books

- B. Razavi, RF Microelectronics, Prentice Hall, 2000, USA.

8- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.
- Electronics lab.

Course coordinator: **Dr. Mohamed Abdellhamid**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: November 2017

Appendix

Course ILOs	A7 Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	B2 Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	B11 Assess and evaluate the characteristics and performance of electronic components, systems and processes.	C1 Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	C04 Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results	C10 Edit and present technical report.	D1 Collaborate effectively within multidisciplinary team.	D7 Search for information and engage in life-long self-learning discipline.
a1.								
a2.								
a3.								
a4.								
a5.								
b1.								
b2.								
c1.								
c2.								
c3.								
d1.								
d2.								

Table (2): Course contents /Course ILOs Matrix

Topic	Course ILOs											
	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Basic Concepts in RF Design.	■	■	■					■				
RF Passive Components.						■			■			
Transmission lines and scattering parameters.	■			■		■	■		■	■	■	
Active RF Components.				■		■	■		■			
RF Power amplifiers.					■	■	■		■	■	■	■
LNA amplifiers and Mixers.					■	■	■		■	■	■	■
Oscillators.					■	■	■		■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs											
	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■					
Discussion	■	■	■	■	■	■	■					
Problem Solving						■	■					
Experiential Learning								■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs											
	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Written Exams	■	■	■	■	■	■	■					
Lab Report and Discussion								■	■	■	■	■
Relative weight %	30%					40%		20%			10%	

جـــــامــــعة المســــــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 514: Microwave Electronic Devices

Programme(s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	Level 5 - 9th semester.
Prerequisites	COM 413
Date of specification approval:	November 2017

A- Basic Information

Title: Microwave Electronic Devices
Code: ELE 514

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: COM 415 Microwave Engineering

B- Professional Information

1- Catalogue Course Description:

Microwave linear beam tubes (O type), double cavity klystron, multicavity klystron amplifier, travelling wave tube, backward wave oscillator, extended interaction oscillator. Microwave crossed field tubes, (M type) Multicavity magnetron oscillator, backward wave amplifier (Amplitron), backward wave crossed field oscillator (Carcinotron), Gyrotron. Microwave solid state devices: Schottky barrier mixer diodes, tunnel diodes, Gunn diodes, IMPATT diodes, microwave transistor amplifier, and oscillator.

2- Overall Aims of the Course:

- ✓ Develop the students' knowledge about microwave electronic devices.
- ✓ Prepare students to analyze, design and evaluate the main parameters of the different devices.
- ✓ Train students to choose the proper and best device suitable for different communication system.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Describe the objectives and functional parameters of each device .

a2. Explain the operational functions of each device .

a3. Recognize the principles of the vacuum tubes and solid state devices.

a4. Explain different types of amplifiers and oscillators.

a5. Describe with the help of Smith Chart the operation of transistor amplifier..

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Deduce the response of the different vacuum devices to different high voltages and beam currents.

b2. Evaluate the performance of the different microwave electronic devices.

b3. Analyze the different criteria of the stability of the transistor amplifiers.

.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Perform practically the analysis of the transistor microwave amplifier using the Smith Chart (the gain, the bandwidth, and the noise level).

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within team.

d2. Work in stressful environment and within constraints.

d3. Communicate effectively

d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	S matrix & S parameters of microwave amplifier	3	2	5
2	Analysis and design of microwave transistor amplifier	3	2	5
3	Stability condition and calculation of the amplifier gain	3	2	5
4	Solid state microwave diodes(Gunn – IMPATT- Tunnel)	6	4	10
5	Crossed field tubes (linear magnetron)	3	2	5
6	Multicavity magnetron- frequency- tuning- strapping	6	4	10
7	Other types of crossed field tubes	3	2	5

8	Velocity modulated tubes	3	2	5
9	Double cavity klystron- calculation of gain	3	2	5
10	Slow wave structures- analysis and types	3	2	5
11	Travelling wave tube – structure- analysis	6	4	10
12	Calculation of the gain and TWT parameters C- N	3	2	5
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work

Project-Calculate the gain, bandwidth of microwave transistor amplifier

6- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and Participation 20%
  - Mid-Term Exams...40%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

Samuel Y. Liao," Microwave devices and circuits", Prentice Hall

M. Chodrow , C. Susskind, " Fundamentals of Microwave Electronics", Mc Graw hill

9- Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course Instructor:	**Prof. Dr. Ibrahim A. Salem**	
Head of Department:	**Prof. Dr. Kamel Hassan**	
Date:	**November - 2017**	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs: A1	A7	A13	A15	B2	B11	B13	C5	D1	D2	D3	D6
	Basic Sciences including classical and solid state physics, mechanics and chemistry	Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and	Principles of the electromagnetic theory, applications of the microwave engineering, microwave electronic devices and antennas in the fields of the communication engineering.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Analyze the performance of microwave and antenna systems.	Apply numerical modelling methods to microwave, antennas, electronic and communication systems.	Collaborate effectively within multidisciplinary team.	Work in stressful environment and within constraints.	Communicate effectively.	Effectively manage tasks, time, and resources.
a1.	■											
a2.			■									
a3.				■								
a4.			■									
a5.		■										
b1.					■							
b2.						■						
b3.							■					
c1.								■				
d1.									■			
d2.										■		
d3.											■	
d4.												■

Table (2): Course Topics / Course ILOs

Topic	Knowledge & Understanding					Intellectual Skills			Practical Skills	General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	d1	d2	d3	d4
S matrix & S parameters of microwave amplifier	■												
Analysis and design of microwave transistor amplifier	■	■			■			■		■	■	■	■
Stability condition and calculation of the amplifier gain							■	■	■				
Solid state microwave diodes(Gunn – IMPATT- Tunnel)			■							■	■	■	■
Crossed field tubes (linear magnetron)	■					■							
Multicavity magnetron- frequency- tuning-strapping			■										
Other types of crossed field tubes	■												
Velocity modulated tubes	■												
Double cavity klystron- calculation of gain		■				■	■			■	■	■	■
Slow wave structures- analysis and types		■											
Travelling wave tube – structure- analysis	■		■										
Calculation of the gain and TWT parameters C- N							■			■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Knowledge & Understanding					Intellectual Skills			Practica l Skills	General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	d1	d2	d3	d4
Lecture	■	■	■	■	■								
Tutorial						■	■	■					
Laboratory									■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Knowledge & Understanding					Intellectual Skills			Practica l Skills	General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■					
Lab Report and Discussion									■	■	■	■	■
Relative weight %	40%					30%			20%	10%			

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 521: Electronic Systems Design

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2016/2017	5^{th} Level– 10^{th} Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electronic System Design **Code: ELE 521**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisites: ELE 420 Electronic Devices

B- Professional Information

1- Catalog Course Description:

Introduction to MOS technology, Geometrical design rules and layout, Circuit characterization, Regular structure (PLA), Clocked systems (FSM), Memory, Scaling, Analog circuits layout, CMOS design project, Introduction to PLDs, CPLDs and FPGAs, Commercial available FPGAS, Design development systems, Design characterization, Design examples.

Overall aims of course

- Enrich students' knowledge about CMOS Technology and Scaling, Trends.
- Develop students' background skills about Design Rules and Layout.
- Enrich students' knowledge about CMOS Transistor Theory and CMOS DC

Characteristics.

- Enrich students' knowledge about Clocked systems and Memory scaling.
- Enrich students' knowledge about PLDs and FPGA design in details.

2- Intended learning outcomes of course (ILOs)

By the end of the course the students will be able to:

a. Knowledge and understanding

a1- List the basic parameters of CMOS Technology and Scaling.
a2- Explain the basic of Design Rules and Layout.
a3- Explain the construction of PLDs and FPGAs.
a4- Predict the Noise Margin and switching voltage of CMOS inverter.

b. Intellectual skills

b1- Develop innovative methods for static and dynamic CMOS circuits.
b2- Analyze CMOS circuit problems and search for optimized solutions.
b3- Design development for digital VLSI systems applications.

c. Professional and practical skills

c1- Design electronic systems for Digital VLSI using CAD tools.
c2- Implement digital circuits using FPGA (Xilinx or Altera).
c3- Write technical reports.

d. General and transferable skills

d1- Collaborate effectively within multidisciplinary team.
d2- Communicate effectively.
d3- Effectively manage tasks, time, and resources.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial (Hrs.)	Total (Hrs.)
1	Introduction to MOS Technology.	6	4	10
2	Geometrical Design Rules and Layout.	6	4	10
3	Circuit Characterization and Regular Structure PLA.	6	4	10
4	Clocked Systems and Memory Scaling.	6	4	10
5	Analog Layout and CMOS Design Project	6	4	10
6	Intro. To PLDs and FPGA (Spartan 3 E)	6	4	10
7	Design Development System and Charactarization	9	6	15
Total		**45**	**30**	**75**

4- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

5- Student Assessment Methods:

5.1- **Mid Term Exams** to assess the skills of problem solving, understanding of related topics.

5.2- **Technical Report** to access: the ability to apply knowledge gained in the course in a real design case.

5.3- **Final Written exam** to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.

6- Assessment schedule

Assessment 1	First Mid-Term Exam	Week 7
Assessment 2	Second Mid-Term Exam	Week 11
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 15

7- Weighting of assessments

Performance	20 %
Quizzes	10 %
Mid-term exams	30 %
Final-term examination	40 %
Total	

8- List of references

a. Course notes

- Taken by the student inside classroom

b. Essential books (text books)

- N. Weste and D. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2010.

c. Recommended books

- J. Rabaey, "Digital Integrated Circuits", 2nd Edition, Prentice-Hall, 2003.

Edward Yang, "Microelectronics Devices",McGraw Hill.1988.

d. Periodicals, Web sites, … etc

-N.A.

9- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.

Course coordinator: **Dr. Mohamed EL Mahalawy**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

	Program ILOs											
	A7	A10	A16	B2	B10	B11	C1	C10	C12	D1	D3	D6
	Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Design and integrate digital systems for certain specific function using the appropriate components.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Edit and present technical report.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs a1.	■	■										
a2.	■											
a3.	■	■	■									
a4.			■									
b1.				■								
b2.				■		■						
b3.					■							
c1.							■		■			
c2.							■					
c3.								■				
d1.										■		
d2.											■	
d3.												■

Table (2): Course contents /Course ILOs Matrix

Topic	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Logic Gates Parameters	■				■								
Switching time of BJT and MOSFET			■			■			■				
TTL and ECL logic Families.	■	■	■			■	■	■		■	■		■
CMOS Inverter				■		■			■				
CMOS Combinational logic				■		■	■	■		■	■	■	
CMOS Dynamic logic				■		■	■	■		■	■	■	■
CMOS Sequential logic				■		■	■	■		■	■		■
Effects of scaling circuit dimensions	■		■									■	
Physical limits to device fabrication	■											■	

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Interactive Lecturing	■	■	■	■	■	■	■						
Discussion	■	■	■	■	■	■	■					■	
Problem Solving					■	■	■						
Experiential Learning								■	■	■		■	■
Cooperative Learning											■		

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Written Exams	■	■	■	■	■	■	■						
Quizzes	■	■	■	■	■	■	■						
Lab Report and Discussion								■	■	■	■	■	■
Relative weight %	40%				40%			10%			10%		

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 522: Semiconductor Devices

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5^{th} year –
Date of specification approval:	November 2017

A-Basic Information

Title: Semiconductor Devices **Code: ELE 522**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	**ELE 420 (Electronic Devices)**

A- Professional Information

1- Catalogue Course Description:

Metal-Semiconductor junctions (Schottky barriers), Heterojunctions, Solar cells, Light emitting diodes, Photodetector diodes, JFET's, MESFET's, MOSFET's, VLSI bipolar and MOS devices, CCD's power devices (PIN and rectifier diodes, SCR's, power switching transistors).

Overall aims of course

This course aims to:

- Introduce advanced semiconductor devices
- Develop a detailed understanding of the design, operating mechanisms and fabrication technology of semiconductor electronic and optoelectronic devices.
- Introducing the design parameters, performance parameters, CAD models, device scaling theory, etc.

2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding

a1- Describe the basic operation of advanced semiconductor devices and their characteristics.
a2- Define design features that determine the device characteristics.
a3- Define the device models for circuit simulation.

b. **Intellectual skills**
   b1- Develop analytical models for the advanced semiconductor devices
   b2- Use compact device models for circuit simulation
   b3- Use semiconductor devices for material and process characterization.
   b4- Examine a detailed understanding of the many and diverse aspects that relate to the operation and exploitation of semiconductor devices.

c. **Professional and practical skills**
   c1- Develop a practical circuit simulation using compact device models
   c2- Develop technical report writing skills
   c3- Design, model and analyze a number of semiconductor device types.

d. **General and transferable skills**
   d1- Communicate effectively.
   d2- Demonstrate Efficient IT capabilities using modern software tools

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Metal-Semiconductor junctions	3	2	5
2	Heterojunctions, Solar cells	3	2	5
3	Solar cells	3	2	5
4	Light emitting diodes	3	2	5
5	Photodetector diodes	3	2	5
6	JFET's and MESFET's	6	4	10
7	MOSFET's	6	4	10
8	VLSI bipolar and MOS devices	6	4	10
9	CCD's power devices (PIN and rectifier diodes).	6	4	10
10	SCR's, power switching transistors	6	4	10
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

5- Assessment

- Final exam: 40%
- Semester work:
  - Mid-Term exams 30%
  - In Class Quizzes 10%
  - Participations 10%
  - Project 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix

6- List of references

a. **Course notes**
-Taken by the student inside classroom

b. **Essential books (text books)**
-Streetman, S. Banerjee, "Solid State Electronic Devices", Prentice-Hall, 2005.

c. **Recommended books**
-S.M. Sze, “Semiconductor Devices: Physics and Technology”, J. Wiley, 2001.
-R.F. Pierret. “Semiconductor Device Fundamentals”, Prentice-Hall, 1995.
-Edward Yang, “Microelectronics Devices”,McGraw Hill.1988.

d. **Periodicals, Web sites, … etc**
- IEEE periodicals, Nanohub.org

7- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.
- Electronics lab.

Course coordinator: **Dr. Ahmed Saeed**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs: A7 – Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	A16 – Analysis, techniques and applications of digital integrated circuits and nanotechnology.	B2 – Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	B11 – Assess and evaluate the characteristics and performance of electronic components, systems and processes.	C5 – Apply numerical modelling methods to microwave, antennas, electronic and communication systems.	C10 – Edit and present technical report.	D1 – Collaborate effectively within multidisciplinary team.	D3 – Communicate effectively.	D6 – Effectively manage tasks, time, and resources.	D7 – Search for information and engage in life-long self-learning discipline.	D9 – Refer to relevant literatures.
a1.	■										
a2.		■									
a3.	■										
b1.				■							
b2.			■								
b3.			■								
b4.			■	■							
c1.					■						
c2.						■					
c3.					■	■					
d1.										■	■
d2.							■	■	■		

Table (2): Course contents /Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Topic	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Metal-Semiconductor junctions	■										■	
Heterojunctions, Solar cells	■										■	
Solar cells	■								■		■	
Light emitting diodes	■					■	■				■	
Photodetector diodes	■					■	■				■	
JFET's and MESFET's	■		■	■							■	■
MOSFET's	■							■	■	■	■	■
VLSI bipolar and MOS devices	■	■							■		■	
CCD's power devices , PIN and rectifier diodes.	■	■									■	
SCR's, power switching transistors		■	■	■	■	■					■	

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Learning-Teaching Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■					
Problem Solving				■	■	■	■				■	
Discussion	■	■	■	■	■	■	■				■	
Experiential Learning								■	■	■		■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Assessment Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Written Exams	■	■	■	■	■	■	■				■	
Lab Reports and Discussion								■	■	■		■
Relative weight %	30%			40%				20%			10%	

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 524: Microsystems Technology

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	5th year –
Date of specification approval:	November 2017

A-Basic Information

Title: Microsystems Technology **Code: ELE 524**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	**ELE 420 (Electronic Devices)**

A- Professional Information

1- Catalogue Course Description:

Physical principles, Design, and micro fabrication technologies pertinent to input (sensor) and output (actuator) devices for multimedia applications such as document and video imaging devices, Micro mirror projection displays and micro-electro-mechanical systems.

Overall aims of course

This course aims to:

- Introduce advanced semiconductor devices
- Develop a detailed understanding of the fabrication technology of semiconductor electronic, optoelectronic devices and microelectromechanical devices.
- Introducing the design parameters, performance parameters and CAD models, etc.

2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding

a1- Describe the basic operation of advanced semiconductor, optical devices and MEMS and their characteristics.
a2- Define design features that determine the device characteristics.
a3- Define the device models for circuit simulation.

b. Intellectual skills

b1- Develop analytical models for the advanced semiconductor, optical devices and MEMS.
b2- Use device models for circuit simulation
b3- Use semiconductor, optical devices and MEMS for material and process characterization.
b4- Examine a detailed understanding of the many and diverse aspects that relate to the operation and exploitation of semiconductor devices.

c. Professional and practical skills

c1- Develop a practical circuit simulation using compact device models
c2- Develop technical report writing skills
c3- Design, model and analyze a number of semiconductor advanced semiconductor, optical devices and MEMS types.

d. General and transferable skills

d1- Communicate effectively.
d2- Demonstrate Efficient IT capabilities using modern software tools

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction to Microsystems, Microfabrication	3	2	5
2	Microfabrication – Cleaning, Oxidation, Doping, bonding	3	2	5
3	Microfabrication – lithography, Process development	3	2	5
4	Review basic mechanical concepts, pressure sensor	3	2	5
5	Piezoresistance, Piezoelectricity	3	2	5
6	Radiation sensing – theory, Optical sensors – photodiodes	6	4	10
7	Optical – CCDs, LED, LCD	9	6	15
8	High energy radiation detectors, Biochemical sensing, Hall effect	6	4	10
9	GMR read/write heads	3	2	5
10	Noise – characteristics of random noise, sources and analysis	6	4	10
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

5- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes..10%
  - Participations..10%
  - Project...10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix

6- List of references

a. **Course notes**
   - Taken by the student inside classroom

b. **Essential books (text books)**
   - Microsystem Design, Stephen Senturia, Springer, 2000.
   - Device Electronics for Integrated Circuits 3rd Ed, R. Muller R. Kamins and M. Chan, Wiley, 2002.

c. **Recommended books**
   - Foundation of MEMS, Chang Liu, Prentice Hall, 2006.
   - Semiconductor Sensors, S.M. Sze, ed., New York: John Wiley & Sons, Inc., 1991. -
   - Principles of Electronic Materials and Devices 3rd Ed, Safa Kasap, McGrawHill, 2006.
   -Analysis and Design of Analog Integrated Circuits 4th Ed, P. Gray & W. Meyer, Wiley, 2007.

d. **Periodicals, Web sites, … etc**
   - IEEE periodicals, Nanohub.org

7- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.
- Electronics lab.

Course coordinator: **Dr. Ahmed Saeed**
Head of Department: **Prof. Dr. Kamel Mohamed Hassan**
Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs										
		A7	A16	B2	B11	C5	C10	D1	D3	D6	D7	D9
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Apply numerical modelling methods to microwave, antennas, electronic and communication systems.	Edit and present technical report.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.	Search for information and engage in life-long self-learning discipline.	Refer to relevant literatures.
Course ILOs	a1.											
	a2.											
	a3.											
	b1.											
	b2.											
	b3.											
	b4.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											

Table (2): Course contents /Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Topic	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Introduction to Microsystems, Microfabrication	■										■	
Microfabrication – Cleaning, Oxidation, Doping, bonding	■										■	
Microfabrication – lithography, Process development	■								■		■	
Review basic mechanical concepts, pressure sensor	■					■	■				■	
Piezoresistance, Piezoelectricity	■					■	■				■	
Radiation sensing, Optical sensors – photodiodes	■		■	■							■	■
Optical – CCDs, LED, LCD	■							■	■	■	■	■
High energy radiation detectors, Biochemical sensing, Hall effect	■	■							■		■	
GMR read/write heads	■	■									■	
Noise – characteristics of sources and analysis		■	■	■	■	■					■	

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Learning-Teaching Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■					
Problem Solving				■	■	■	■				■	
Discussion	■	■	■	■	■	■	■				■	
Experiential Learning								■	■	■		■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding			Intellectual Skills				Practical Skills			General Skills	
Assessment Method	a1	a2	a3	b1	b2	b3	b4	c1	c2	c3	d1	d2
Written Exams	■	■	■	■	■	■	■				■	
Lab Reports and Discussion								■	■	■		■
Relative weight %	30%			40%				20%			10%	

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 525: Integrated Circuits Technology

Program (s) on which the course is given:	B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5^{th} level
Date of specification approval:	November 2017

A- Basic Information

Title: Integrated Circuits Technology **Code: ELE 525**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 420 Electronic Devices, and ELE 570 Microelectronic Systems

B- Professional Information

1- Catalogue Course Description:
Defining terms, Technology roadmap, Basic silicon processes, Fabrication of passive and active components, Process integration and standard technologies, Process simulation, Layout design rules, Layout parasitics, Typical examples, Layout techniques, Interconnect modeling, Substrate coupling issues, ESD protection.

2- Overall Aims of the Course:
By the end of this course, students will be able to:
- ✓ Improve student's foundational background, theories and mechanism of the state-of-the art of integrated circuit technology.
- ✓ Develop the student skills in modeling of the interconnect parameters, layout design, and the design rules for integrated circuit technology.
- ✓ Improve students understanding of the link between the circuit design and the layout design by introducing design parameters, performance parameters, CAD models, etc.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1- State the basic definitions and terminologies of the state-of-the art of integrated circuit technology.

a2- Explain methods of silicon processes and fabrication; wafer formation, photolithography, well and channel formation, silicon dioxide (SiO2), isolation, gate oxide, gate and source/drain formations, contacts and metallization, and passivation.

a3- Define the layout design rules including well rules, transistor rules, contact rules, metal rules, via rules, micron design rules, and MOSIS scalable design rules.

a4- Estimate the modeling of the interconnect parameters; wire geometry, interconnect modelling, capacitance, resistance, and inductance, skin effect, interconnect impact, delay, energy, crosstalk, inductive effects, and an aside on effective resistance and Elmore delay, interconnect engineering, and logical effort with wires.

b- Intellectual Skills

By the end of this course the student should be able to:

b1- Develop layout models for electronic circuits applied on the integrated circuit technology;

b2- Use electronic circuit layout models for circuit simulation;

b3- Use the interconnect parameters to evaluate circuit performance.

c- Professional and Practical Skills:

By the end of this course the student should be able to:

c1- Build electronic circuits for a specific application using related layout software tools;

c2- Develop technical report writing skills.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Basic definitions and terminologies.	3	2	5
2	Silicon processes and fabrication. Wafer formation.	3	2	5
3	Photolithography. Well and channel formation. Silicon dioxide (SiO2), and isolation. Gate oxide, gate and source/drain formations. Contacts, metallization, and passivation.	6	4	10
4	Layout design rules for: well, transistor, contact, metal, via, and micron design.	6	4	10
5	MOSIS scalable design rules.	6	4	10
6	Modeling of the interconnect parameters: wire geometry, interconnect modelling, capacitance, resistance, inductance, skin effect, and interconnect impact.	6	4	10
7	Delay, energy, and crosstalk.	6	4	10
8	Elmore delay.	3	2	5
9	Logical effort with wires.	3	2	5
10	Layout parasitics ESD protection.	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

The ability to apply specific circuits gained in the area of the course to design, and simulate based on the software tool.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam: 40%
- Semester work:
  - In Class Quizzes 20%
  - Mid-Term Exams 30%
  - Performance 10%
- **Total 100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

- ✓ **Course notes:** Instructor notes**.**
- ✓ **Recommended book (text books)**: Neil H.E. Weste and David Harris; "CMOS VLSI Design, A Circuits and Systems Perspective", 4rd Ed.; Pearson Addison-Wesley; 2011.
- ✓ **Essential book**: Jan M. Rabaey; “Digital Integrated Circuits”; 2nd Ed.; Prentice Hall; 2003.

8- Facilities required for teaching and learning:

B- White board.
C- Data show for presentations.
D- Computer Lab.

Course coordinator:	Assoc. Prof. Dr. Mohamed Hassan El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs									
		A07	A16	B02	B11	C04	C10	D01	D03	D06	D07
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Edit and present technical report.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.										
	a2.										
	a3.										
	a4.										
	b1.										
	b2.										
	b3.										
	c1.										
	c2.										
	d1.										
	d2.										
	d3.										
	d4.										

Table (2): Course Content/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills		General Skills			
Topic	a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3	d4
Basic definitions and terminologies.	■												
Silicon processes and fabrication. Wafer formation.		■											
Photolithography. Well and channel formation. Silicon dioxide (SiO2), and isolation. Gate oxide, gate and source/drain formations. Contacts, metallization, and passivation.		■											
Layout design rules for: well, transistor, contact, metal, via, and micron design.			■		■	■		■		■	■	■	■
MOSIS scalable design rules.			■			■		■		■	■	■	■
Modeling of the interconnect parameters: wire geometry, interconnect modelling, capacitance, resistance, inductance, skin effect, and interconnect impact.				■			■	■	■	■	■	■	■
Delay, energy, and crosstalk.				■			■	■	■	■	■	■	■
Elmore delay.				■			■	■	■	■	■	■	■
Logical effort with wires.				■			■	■	■	■	■	■	■
Layout parasitics ESD protection.				■			■	■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills		General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■	■						
Discussion				■	■		■		■		■		
Problem Solving					■	■	■						
Experimental Learning								■			■	■	
Cooperative Learning										■			
Research													■
Presentation											■		■
Site Visit (Guided Field Trip)			■					■					■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills		General Skills			
Assessment Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■						
Lab Report and Discussion								■	■	■	■	■	■
Relative weight %	40%				40%			10%		10%			

جـــــامـــعة المســــــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 526: Analog Integrated Circuit Design

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2016/2017	5^{th} Level–
Date of specification approval:	November 2017

A- Basic Information

Title: Analog Integrated Circuits Design **Code: ELE 526**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisites: ELE 364 Electronic Circuits

B- Professional Information

1- Catalog Course Description:

Introduction to analog VLSI, Device modelling, Basic analog building blocks (current mirrors, common source, common drain, common gate, cascode), Noise, Voltage and current references differential pair, Frequency response, Stability and frequency compensation, Operational amplifiers (basic, two-stage, Miller, symmetrical, telescopic, folded, cascode), Noise, Voltage and current references.

Overall aims of course

- Enrich students' knowledge about analysis, design, and applications of modern analog circuits using integrated bipolar and field effect transistor technologies.

- Train students about the principles of analog circuits and apply the techniques for the design of analog integrated circuit (Analog IC's).
- Develop students' skills to implement a complete analog system.

2- Intended learning outcomes of course (ILOs)

By the end of the course the students will be able to:

a- <u>Knowledge and Understanding:</u>

By the end of this course the student should be able to:

a1. Explain the fundamentals of the amplifiers and their frequency response.

a2. Recognize the design of the OPAMP amplifier circuits and their problems and applications.

a3. Define the principles of the voltage and current references differential pair

a4. Explain the principles of feedback amplifier circuits.

a5. Define the suitable device model for VLSI applications.

b- **<u>Intellectual Skills</u>**

By the end of this course the student should be able to:

b1. Analyze problems of amplifier circuits.

b2. Use professional software tools for design and implementing of electronic circuits.

b3. Design of electronic circuits for engineering applications.

b4. Assess and evaluate the characteristics and performance of analog circuits.

c- <u>Professional and Practical Skills</u>

By the end of this course the student should be able to:

c1. Build a complete application circuit.

c2. Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments.

c3. Read thoroughly datasheets and identify appropriate specifications for required device and circuits.

d- <u>General and Transferable Skills:</u>

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial (Hrs.)	Total (Hrs.)
1	Introduction to analog VLSI	3	2	5
2	Device modelling and parameters	6	4	10
3	Basic analog building blocks (current mirrors, common source, common drain, common gate, cascode), and Noise	6	4	10
4	Voltage and current references differential pair,	9	6	15
5	Frequency response,	6	4	10
6	Stability and frequency compensation,	6	4	10
7	Operational amplifiers (basic, two-stage, Miller, symmetrical, telescopic, folded, cascode)	9	6	15
Total		**45**	**30**	**75**

4- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

5- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams...30%
  - In Class Quizzes..10%
  - Participations..10%
  - Project...10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix

6- List of references

a. Course notes

- Taken by the student inside classroom

b. Essential books (text books)

- P.R. Gray and R.G. Meyer, Analysis and Design of Analog Integrated Circuits, Fourth Edition, John Wiley and Sons.
-

c. Periodicals, Web sites, … etc

-N.A.

7- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.

Course coordinator: **Prof. Mohamed Elmahalawy**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

Course ILOs	A07 Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	B01 Think in a creative and innovative way in problem solving and design.	B03 Use software tools to develop computer programs for engineering applications.	B11 Assess and evaluate the characteristics and performance of electronic components, systems and processes.	C03 Design a process, component or system and practice the quality of electronic and communication systems.	C04 Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	C12 Read thoroughly datasheets and identify appropriate specifications for required system or	D01 Collaborate effectively within multidisciplinary team.	D03 Communicate effectively.	D06 Effectively manage tasks, time, and resources	D07 Search for information and engage in life-long self-learning discipline
a1.											
a2.											
a3.											
a4.											
a5.											
b1.											
b2.											
b3.											
b4.											
c1.											
c2.											
c3.											
d1.											
d2.											
d3.											
d4.											

Table (2): Course Content/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Practical Skills			General Skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Introduction to analog VLSI																
Device modelling and parameters																
Basic analog building blocks (current mirrors, common source, common drain, common gate, cascode), and Noise																
Voltage and current references differential pair,																
Frequency response																
Stability and frequency compensation,																
Operational amplifiers (basic, two-stage, Miller, symmetrical, telescopic, folded, cascode)																

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing																
Problem Solving																
Discussion																
Experiential Learning																

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills				Practical Skills			General Skills			
Assessment Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	c1	c2	c3	d1	d2	d3	d4
Written Exams																
Lab Report and Discussion																
Relative weight %	30%					40%				20%			10%			

جـــــامـــــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 561: Integrated Circuits

Program (s) on which the course is given:	B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5th level
Date of specification approval:	November 2017

A- Basic Information

Title: Integrated Circuits **Code: ELE 561**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 420 Electronic Devices

B- Professional Information

1- Catalogue Course Description:
Switching characteristics of transistors, Digital integrated circuits including ECL, T^2L, CMOS, BiCMOS, Low voltage-low power and high performance design issues, Lab project, Design of analog circuits such as: current sources and mirrors, differential, low-noise and feedback amplifiers, mixers and oscillators, Applications of these circuits in areas such as A/D and D/A conversion and receiver front-end.

2- Overall Aims of the Course:
By the end of this course, students will be able to:
- ✓ Understand the basic principles of families of digital integrated circuits;
- ✓ Enhance the student skills in the basic principles of low-voltage low-power design issues.
- ✓ Understand the basic principles and theory of analog integrated circuits;
- ✓ Understand the basic principles and theory of Mixed-signal integrated circuits;
- ✓ Enhance the student skills in the design of communication subsystems.
- ✓ Design, and simulate electronic circuits using the Electronic Design Automation (EDA);
- ✓ Develop technical report writing skills.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1- Explain the basic principles of digital integrated circuits including ECL, T^2L, CMOS, BiCMOS.

a2- Explain the basic principles and theory of low-voltage low-power design issues.

a3- Explain the basic principles and theory of low-noise and feedback amplifiers in analog integrated circuits.

a4- Explain the basic principles and theory of the A/D and D/A conversion in Mixed-signal integrated circuits.

a5- Explain the basic principles mixers and oscillators in the receiver front-end.

a6- Select the appropriate application of communication subsystems in the integrated circuit design.

b- Intellectual Skills

By the end of this course the student should be able to:

b1- Compare between different digital logic families in the digital integrated styles in terms of the functionality and performance.

b2- Analyze low-noise and feedback amplifiers and the A/D and D/A conversion.

b3- Analyze and design building units in the receiver front-end.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Build the basic components and requirements to design a communication subsystem.

c2. Develop the design and implementation of electronic circuits using software tools.

c3. Develop technical report writing skills.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Families of digital integrated circuits.	6	4	10
2	Designing for high-speed digital circuits	3	2	5
3	Designing for low-power digital circuits	3	2	5
4	Low-noise and feedback amplifiers in analog integrated circuits	9	6	15
5	The A/D and D/A converters	9	6	15
6	Basic issues of mixers in the receiver front-end.	6	4	10
7	Basic issues of oscillators in the receiver front-end.	6	4	10
8	Applications of the communication subsystems in the integrated circuit design	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

The ability to apply specific electronic circuits gained in the area of the course to design, simulate, and implement based on the software tool.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..........40%
- Semester work:
  - In Class Quizzes 20%
  - Mid-Term Exams..........30%
  - Report or project..........10%
- **Total..........100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

- **Course notes:** Instructor notes**.**
- **Recommended book (text books)**: B. Razavi, RF Microelectronics, Prentice-Hall, 2012.
  Recommended book (text books): Behzad Razavi, "Design of Analog CMOS Integrated Circuits," McGraw-Hill, 2001.
- **Essential book**: Neil H.E. Weste and David Harris; "CMOS VLSI Design, A Circuits and Systems Perspective", 4rd Edition; Pearson Addison-Wesley; 2011.
- **Periodicals, Web sites, etc.**

8- Facilities required for teaching and learning:

- Lectures/ (White board + Data-show for presentations).
- Assignments and homework.
- Electronic and computer laboratories.

Course coordinator:	Assoc. Prof. Dr. Mohamed Hassan El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs											
		A07	A16	B02	B10	B11	C03	C04	C10	D01	D03	D06	D07
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems	Design and integrate digital systems for certain specific function using the appropriate components.	Assess and evaluate the characteristics and performance of electronic components, systems and processes	Design a process, component or system and practice the quality of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data analyse and interpret results.	Edit and present technical report.	Collaborate effectively within multidisciplinary team	Communicate effectively	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.												
	a2.												
	a3.												
	a4.												
	a5.												
	a6.												
	b1.												
	b2.												
	b3.												
	c1.												
	c2.												
	c3.												
	d1.												
	d2.												
	d3.												
	d4.												

Table (2): Course Content/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Families of digital integrated circuits.	■						■				■					
Designing for high-speed digital circuits	■						■									
Designing for low-power digital circuits		■					■									
Low-noise and feedback amplifiers in analog integrated circuits			■					■		■	■					
The A/D and D/A converters				■				■		■	■					
Basic issues of mixers in the receiver front-end.					■				■	■	■					
Basic issues of oscillators in the receiver front-end.					■				■	■	■					
Applications of the communication subsystems in the integrated circuit design						■			■	■		■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■										
Discussion		■	■	■	■		■	■						■		
Problem Solving							■	■	■							
Experimental Learning											■			■	■	
Cooperative Learning													■			
Research																■
Site Visit (Field Trip)						■				■	■					
Project / Assignment						■			■			■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■	■						
Lab Report and Discussion											■	■	■	■	■	■
Relative weight %	40%						40%			10%			10%			

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 562: VLSI Design

Program (s) on which the course is given:	B.Sc. in Electrical Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5rd level
Date of specification approval:	November 2017

A- Basic Information

Title: VLSI Design **Code: ELE 562**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 420 Electronic Devices

B- Professional Information

1- Catalogue Course Description:
Introduction to VLSI systems, Review of digital systems, CMOS logic and fabrication, MOS transistor theory, Layout design rules, Circuit characterization and performance estimation, Circuit simulation, Combinational and sequential circuit design, Static and dynamic CMOS gates, Memory system design, Design methodology and tools

2- Overall Aims of the Course:

By the end of this course, students will be able to:

- ✓ Prepare students to analyze CMOS Digital Circuits.
- ✓ Enrich students' knowledge about VLSI technology.
- ✓ Enrich students' knowledge about fundamentals of static and dynamic memory circuits.
- ✓ Train students' to use software tools using the Electronic Design Automation (EDA).

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1- Illustrate methods of fabrication of Integrated circuits and CMOS digital applications.

a2- List different styles of logic circuits.

a3- Estimate noise-margin, switching speed and power dissipation.

a4- Recognize static and dynamic implementation of CMOS digital circuits.

b- Intellectual Skills

By the end of this course the student should be able to:

b1- Analyse the voltage transfer characteristics and transient characteristics of the basic CMOS inverter.

b2- Compare between different logic styles.

b3- Evaluate performance of digital circuits.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Apply theories and techniques of mathematics, basic electricity and electronics to solve electronic circuit problem.

c2. Seek the components and requirements for designing a complete application circuit.

c3. Use computational facilities and related software tools to design digital circuits.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

4- Course ILOs versus Program ILOs relation

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

5- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Definitions and Terminologies State-of-the art of CMOS Technology	3	2	5
2	Design Rules, MOSFET Model, MOSFET Characteristics, Design methodology and tools	3	2	5
3	Static Behaviour of CMOS Inverter	3	2	5
4	Dynamic Behaviour of CMOS Inverter	6	4	10
5	Static Combinational Circuits	3	2	5
6	Designing for Speed and Low Power	3	2	5
7	Dynamic Combinational Circuits	3	2	5
8	Static Sequential Circuits	3	2	5
9	Dynamic Sequential Circuits	3	2	5
10	Design Sequential Logic Circuits using different Clocking Strategy.	6	4	10
11	Semiconductor Memories and RAM Cores.	6	4	10
12	Peripheral Memory Circuits.	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

6- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Computer Lab	Static Behaviour of CMOS Inverter
Experiment#2	Computer Lab	Dynamic Behaviour of CMOS Inverter
Experiment#3	Computer Lab	Static digital Circuits
Experiment#4	Computer Lab	Dynamic digital Circuits.

7- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

8- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes 20%
  - Mid-Term Exams..30%
  - Lab Experiments & Project..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

9- List of references:

- **Recommended book (text books)**: Jan M. Rabaey; “Digital Integrated Circuits”; 2nd Edition; Prentice Hall; 2003.
- **Essential book**: Neil H.E. Weste and David Harris; "CMOS VLSI Design, A Circuits and Systems Perspective", 3rd Edition; Pearson Addison-Wesley; 2005.

10- Facilities required for teaching and learning:

- Lectures/ (White board + Data-show for presentations).
- Assignments and homework.
- Computer laboratory.

Course coordinator:	Assoc. Prof. Dr. Mohamed Hassan El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Illustrate methods of fabrication of Integrated circuits and CMOS digital applications.

a2- List different styles of logic circuits.

a3- Estimate noise-margin, switching speed and power dissipation.

a4- Recognize static and dynamic implementation of CMOS digital circuits.

a- Intellectual Skills

By the end of this course the student should be able to:

b1- Analyse the voltage transfer characteristics and transient characteristics of the basic CMOS inverter.

b2- Compare between different logic styles.

b3- Evaluate performance of digital circuits.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Apply theories and techniques of mathematics, basic electricity and electronics to solve electronic circuit problem.

c2. Seek the components and requirements for designing a complete application circuit.

c3. Use computational facilities and related software tools to design digital circuits.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

Table (1): Course ILOs/ Program ILOs Matrix

Program ILOs										
A07	A16	B01	B11	C01	C04	C12	D01	D03	D06	D07

Course ILOs		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Think in a creative and innovative way in problem solving and design.	Assess and evaluate the characteristics and performance of electronic components, systems and processes	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
	a1.											
	a2.											
	a3.											
	a4.											
	b1.											
	b2.											
	b3.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											
	d3.											
	d4.											

Table (2): Course Content/Course ILOs Matrix

	Course ILOs													
	Knowledge & Understanding				Intellectual Skills						General Skills			
Topic	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Definitions & Terminologies, State-of-the art of CMOS Technology	■													
Design Rules, MOSFET Model, MOSFET Characteristics, Design methodology and tools	■							■						
Static Behaviour of CMOS Inverter		■	■		■			■		■	■	■	■	■
Dynamic Behaviour of CMOS Inverter				■	■		■	■		■	■	■	■	■
Static Combinational Circuits		■				■				■	■	■	■	■
Designing for Speed and Low Power				■		■	■							
Dynamic Combinational Circuits		■				■	■		■	■	■	■	■	■
Static Sequential Circuits		■				■								
Dynamic Sequential Circuits		■				■								
Design Sequential Logic Circuits using different Clocking Strategy.				■		■	■		■					
Semiconductor Memories and RAM Cores.		■						■						
Peripheral Memory Circuits.						■	■							

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs													
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■	■	■							
Discussion	■	■	■	■	■	■	■						■	
Problem Solving					■	■	■							
Experiential Learning								■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■	■	■					
Lab Report and Discussion											■	■	■	■	■	■
Relative weight %	30%						40%			20%			10%			

جــــــامــــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 563: Integrated VLSI Systems

Program (s) on which the course is given:	B.Sc. in Electrical Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	5rd level
Date of specification approval:	November 2017

A- Basic Information

Title: Integrated VLSI Systems **Code: ELE 563**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 420 Electronic Devices

B- Professional Information

1- Catalogue Course Description:
Integrated system design, Memory cells and systems, Logic arrays, VLSI design methodologies, Applications in digital signal and data processing systems, Low-power, low-voltage design issues.

2- Overall Aims of the Course:
By the end of this course, students will be able to:

- ✓ Apply the operational theories of static and dynamic digital circuits based on their circuit functionality and performance;
- ✓ Understand the basic principles and theory of operation of static and dynamic memory circuits;
- ✓ Design, and simulate digital circuits with emphasis on the performance and chip area using the Electronic Design Automation (EDA);
- ✓ Enhance the student skills in the design applications of the digital signal processing (DSP) subsystems.
- ✓ Enhance the student skills in the basic principles and theory of low-voltage low-power design issues.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1- Explain basic issues in digital integrated circuit design, CMOS IC layout of complex gates and design rules.

a2- Explain optimizing timing issues in CMOS circuits.

a3- Estimate different styles of logic circuits.

a4- Explain the static and dynamic implementation of memory circuits.

a5- State the strategies of digital integrated circuits using FPGAs in DSP applications.

a6- Explain the basic principles and theory of low-voltage low-power design issues.

b- Intellectual Skills

By the end of this course the student should be able to:

b1- Investigate performance of digital logic and memory circuits based in transistor level.

b2- Compare between different digital logic and memory styles.

b3- Apply the presented digital design in the DSP applications and low-voltage low-power design.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Interpret theories and techniques of digital electronics to solve digital circuit problem.

c2. Build the components and requirements for designing a complete digital circuit application.

c3. Develop the design and implementation of digital integrated circuits using software tools.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Definitions and Terminologies of the state-of-the art of digital integrated technology.	3	2	5
2	Design Rules Design methodology and tools	3	2	5
3	Static behaviour of digital circuits	6	4	10
4	Dynamic behaviour of digital circuits	6	4	10
5	Designing for high-speed digital circuits	3	2	5
6	Designing for low-power digital circuits	3	2	5
7	Design digital circuits using different clocking strategy.	3	2	5
8	Semiconductor static memories and RAM Cores.	3	2	5
9	Semiconductor dynamic memories and RAM Cores.	3	2	5
10	Peripheral memory circuits.	3	2	5
11	Apply DSP applications	6	4	10
12	Low-voltage low-power design	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

The ability to apply specific digital circuits gained in the area of the course to design, simulate, and implement based on the software tool.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes 20%
  - Mid-Term Exams..30%
  - Report or project..10%
- **Total..100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

- Course notes: Instructor notes**.**
- **Recommended book (text books)**: Jan M. Rabaey; "Digital Integrated Circuits"; 2nd Ed.; Prentice Hall; 2003.
- **Essential book**: Neil H.E. Weste and David Harris; "CMOS VLSI Design, A Circuits and Systems Perspective", 3rd Ed.; Pearson Addison-Wesley; 2005.
- **Periodicals, Web sites, … etc.**

8- Facilities required for teaching and learning:

- Lectures/ (White board + Data-show for presentations).
- Assignments and homework.
- Electronic and computer laboratories.

Course coordinator:	Assoc. Prof. Dr. Mohamed Hassan El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs										
		A07	A16	B01	B11	C01	C03	C04	D01	D03	D06	D07
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Think in a creative and innovative way in problem solving and design.	Assess and evaluate the characteristics and performance of electronic components, systems and processes	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Design a process, component or system and practice the quality of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data analyse and	Collaborate effectively within multidisciplinary team	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.											
	a2.											
	a3.											
	a4.											
	a5.											
	a6.											
	b1.											
	b2.											
	b3.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											
	d3.											
	d4.											

Table (2): Course Content/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Definitions and Terminologies of the state-of-the art of digital integrated technology.	■															
Design Rules Design methodology and tools	■											■	■	■	■	■
Static behaviour of digital circuits			■					■			■					
Dynamic behaviour of digital circuits		■	■					■			■					
Designing for high-speed digital circuits		■					■			■						
Designing for low-power digital circuits						■	■			■						
Design digital circuits using different clocking strategy.		■					■			■						
Semiconductor static memories and RAM Cores.				■				■			■					
Semiconductor dynamic memories and RAM Cores.				■				■			■					
Peripheral memory circuits.				■				■			■					
Apply DSP applications					■				■	■	■	■	■	■	■	■
Low-voltage low-power design						■			■	■	■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecture	■	■	■	■	■	■										
Discussion		■	■		■		■	■						■		
Problem Solving							■	■	■							
Experimental Learning												■		■	■	
Cooperative Learning													■			
Research																■
Site Visit (Field Trip)					■	■				■	■					
Project / Assignment					■	■			■			■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills			
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Written Exams																
Lab Report and Discussion																
Relative weight %	40%						40%			10%			10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 564: Integrated Circuits Applications

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2016/2017	5^{th} Level–
Date of specification approval:	November 2017

A- Basic Information

Title: Integrated Circuits Applications **Code: ELE 564**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisites: ELE 420 Electronic Devices, COM 411 Communication I

B- Professional Information

1- Catalog Course Description:

Amplifiers: RF IF and video, Oscillators: tuned and untuned oscillators stability, VCO, phase locked loop, Modulators: AM, SSB balanced FM, PM, pulse modulators, digital modulators, Demodulators: AM, FM and PM detectors, Transmitter and receiver circuits, Circuit simulators, Digital, Analog and mixed mode.

Overall aims of course

- Build analytical skills needed for the field of radio frequency design.
- Build analytical skills needed for analyzing basic radio frequency performance parameters.
- Enrich students' knowledge in the field of transceivers system and circuit design.

2- Intended learning outcomes of course (ILOs)

By the end of the course the students will be able to:

a. Knowledge and understanding

a1- List the operation of common transceiver architectures for RF transmission and reception.

a2- Explain the concept of noise figure, non-linearity, blockers, and sensitivity in RF transceivers

a3- Asses the performance requirements of different building blocks of RF transceivers such as noise figure, gain and non-linearity.

a4- Describe the concept of impedance matching and impedance transformation in RF circuits

a5- Recognize the usage of low noise amplifiers, mixers, voltage controlled oscillators, power amplifiers, and phase locked loops.

b. Intellectual skills

b1- Think intuitively about RF transceivers and its building blocks.

b2- Analyze system requirements of RF transceivers.

c. Professional and practical skills

c1- Simulate RF transceivers and its building blocks.

c2- Use software tool to build the different RF building blocks.

c3- Prepare technical report.

d. General and transferable skills

d1- Work in teams.

d2- Propose and formulate new ideas.

3- Contents

#	Topics	Lec. (Hrs.)	Tutorial (Hrs.)	Total (Hrs.)
1	Amplifiers: RF IF and video,	6	4	10
2	Oscillators: tuned and untuned oscillators stability, VCO	6	4	10
3	phase locked loop	6	4	10
4	Modulators: AM, SSB balanced FM, PM, pulse modulators, digital modulators, Demodulators: AM, FM and PM detectors,	12	8	20
5	Transmitter and receiver circuits,	6	4	10
6	Circuit simulators	3	2	5
7	Digital, Analog and mixed mode.	6	4	10
Total		**45**	**30**	**75**

4- Teaching and learning methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

5- Assessment

- Final exam: 40%
- Semester work:
  - Mid-Term exams 30%
  - In Class Quizzes 10%
  - Participations 10%
  - Project 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix

6- List of references

a. Course notes

- Taken by the student inside classroom

b. Essential books (text books)

- P.R. Gray and R.G. Meyer, Analysis and Design of Analog Integrated Circuits, Fourth Edition, John Wiley and Sons.
- A. B. Grebene, Bipolar and MOS Analog Integrated Circuit Design, John Wily,2003,New York.
- D. O. Pederson, K. Mayaram, Analog Integrated Circuits for Communication, Springer Science.

c. Periodicals, Web sites, … etc

- IEEE periodicals

7- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.

Course coordinator: **Prof. Ahmed Saeed**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs																		
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Theories, techniques, analysis of analog and digital signals processing.	Theories, techniques, and technology in the field of communication links including satellite, optical fibers, and mobile communication systems.	Think in a creative and innovative way in problem solving and design.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Use software tools to develop computer programs for engineering applications.	Plan, conduct and write a technical report on a project or an assignment.	Analyze and design communication systems based on the knowledge acquired.	Combine, exchange, and assess different ideas and knowledge from range of sources for solving electronic and communication systems problems.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Merge the knowledge of electronic and communication systems to improve design, products and services.	Design a process, component or system and practice the neatness and aesthetics of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments.	Edit and present technical report.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team.	Demonstrate efficient IT capabilities.	Effectively manage tasks, time, and resources.
		A07	A012	A13	B01	B02	B03	B04	B08	B09	B11	C01	C02	C03	C04	C10	C12	D01	D04	D06
Course ILOs	a1		■	■																
	a2		■	■																
	a3	■		■																
	a4	■																		
	a5	■	■																	
	b1				■			■	■		■									
	b2					■	■		■	■	■									
	c1											■	■				■			
	c2													■	■		■			
	c3															■				
	d1																	■		■
	d2																		■	

Table (2): Course Contents/Course ILOs Matrix

Course Contents	Course ILOs											
	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
Topic	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Amplifiers: RF IF and video,	■		■		■		■	■	■			
Oscillators: tuned and untuned oscillators stability, VCO		■	■	■			■	■				■
phase locked loop		■			■		■	■	■			
Modulators: AM, SSB balanced FM, PM, pulse modulators, digital modulators, Demodulators: AM, FM and PM detectors,			■	■		■	■	■				
Transmitter and receiver circuits,	■		■	■		■	■	■				
Circuit simulators								■	■	■	■	
Digital, Analog and mixed mode.					■	■	■			■		■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
Learning-Teaching Method	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■	■	■			
Problem Solving						■	■					
Discussion	■	■	■	■	■	■	■					
Experiential Learning						■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills		Practical Skills			General Skills	
Assessment Method	a1	a2	a3	a4	a5	b1	b2	c1	c2	c3	d1	d2
Written Exams												
Lab Report and Discussion												
Relative weight %	30%					40%		20%			10%	

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

ELE 570: Microelectronic Systems

Program (s) on which the course is given:	B.Sc. in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level: 2016/2017	4th year – 8th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electronic Devices **Code: ELE 570**
Credit Hours: **3 Cr. Hrs.**
Lectures: 3 Hrs.
Tutorial/Lab: 2 Hrs.
Total: 5 Hrs.
Prerequisite: ELE 420 Electronic Devices

B- Professional Information

1- Catalog Course Description

MOS LOGIC gates; NMOS ,CMOS pseudo NMOS; dynamic logic; dynamic cascaded logic; domino logic; 2 and 4 phase logic; pass transistor logic. Control and timing; synchronous and asynchronous ; self-timed systems; multi-phase clocks; register to register transfer; Effects of scaling circuit dimensions; physical limits to device fabrication. Static & dynamic memories.

2- Overall aims of course

- Enrich students' knowledge about logic gates, immunity voltage, and fan out.
- Enrich students' knowledge about TTL and CMOS logic circuits.

3- Intended learning outcomes of course (ILOs)

By the end of the course the students will be able to:

a. Knowledge and understanding

a1- Describe the basic parameters of logic gates.

a2- Explain the construction of BJT logic gates circuits.

a3- Explain the construction of MOSFET and CMOS logic gates circuits.

a4- Determine the switching time and power consumption of MOSFET and CMOS gates.

b. Intellectual skills

b1- Develop analytical models for electronic circuits and systems.

b2- Analyze electronic circuit problems and search for optimized solutions.

b3- Design electronic circuits for digital systems applications.

c. Professional and practical skills

c1- Perform electronic circuits design for a specific application using logic gates.

c2- Implement an electronic circuit for specific digital circuits.

c3- Write technical reports.

d. General and transferable skills

d1- Work in a team.

d2- Collaborate effectively.

4- Course ILOs versus Program ILOs relation

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

5- Contents

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Logic Gates Parameters	6	4	10
2	Switching time of BJT and MOSFET	3	2	5
3	TTL and ECL logic Families.	9	6	15
4	CMOS Inverter	6	4	10
5	CMOS Combinational logic	6	4	10
6	CMOS Dynamic logic	3	2	5
7	CMOS Sequential logic	6	4	10
8	Effects of scaling circuit dimensions	3	2	5
9	Physical limits to device fabrication	3	2	5
	Total	**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

6- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix

7- Student Assessment Methods:

- Final exam :...40%

- Semester work:
  - In Class Quizzes 20%
  - Mid-Term Exams...30%
  - Lab Experiments & Project 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references

a. Essential books (text books)

- N. Weste and D. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2010.

b. Recommended books

- J. Rabaey, "Digital Integrated Circuits", 2nd Edition, Prentice-Hall, 2003.

Edward Yang, "Microelectronics Devices",McGraw Hill.1988.

9- Facilities required for teaching and learning

- Board and Data Show projector.
- Computer with software.
- Electronics lab.

Course coordinator: **Dr. Mohamed Abouelatta**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: November 2017

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs										
		A7	A10	A16	B2	B10	B11	C1	C10	C12	D1	D3
		Fundamentals, theories and applications of electronic components, devices fabrication and electronic circuits.	Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Analysis, techniques and applications of digital integrated circuits and nanotechnology.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Design and integrate digital systems for certain specific function using the appropriate components.	Assess and evaluate the characteristics and performance of electronic components, systems and processes.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Edit and present technical report.	Read thoroughly datasheets and identify appropriate specifications for required system or device.	Collaborate effectively within multidisciplinary team.	Communicate effectively.
Course ILOs	a1.											
	a2.											
	a3.											
	a4.											
	b1.											
	b2.											
	b3.											
	c1.											
	c2.											
	c3.											
	d1.											
	d2.											

Table (2): Course contents /Course ILOs Matrix

Topic	Course ILOs											
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills	
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Logic Gates Parameters	■				■							
Switching time of BJT and MOSFET			■			■			■			
TTL and ECL logic Families.	■	■	■			■	■	■		■	■	
CMOS Inverter				■		■			■			
CMOS Combinational logic				■		■	■	■		■	■	■
CMOS Dynamic logic				■		■	■	■		■	■	■
CMOS Sequential logic				■		■	■	■		■	■	
Effects of scaling circuit dimensions	■		■									■
Physical limits to device fabrication	■											■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs											
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills	
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■					
Discussion	■	■	■	■	■	■	■					■
Problem Solving					■	■	■					
Experiential Learning								■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs											
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills	
	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2
Written Exams	■	■	■	■	■	■	■					
Lab Report and Discussion								■	■	■	■	■
Relative weight %	30%				40%			20%			10%	

General Electrical Engineering Courses (CMP, EPR)

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

CMP 334: Digital Systems and Computer Organization

Program (s) on which the course is given:	B.Sc. in Electrical Power Engineering, and B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	3rd level – 5th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Digital Systems and Computer Organization **Code: CMP 334**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 215 Logic Design and Digital Circuits, and CMP 132 Computer Programming.

B- Professional Information

1- Catalogue Course Description:
Sequential logic: state table and transition diagram, design of digital systems, incompletely specified states, counters, shift registers, miscellaneous topics: adders, subtractors, decoders, coders, multiplexer/demultiplexer, memories (ROM, EPROM, EEPROM, FLASH, RAM). Description of a hypothetical computer system, The CPU main memory, I/O subsystem and all related components. The architecture of the Intel 80x86 based microprocessors, Linkers, library managers and debugging tool. Macro assembler programming techniques involving building, Incorporating and maintaining libraries, and using assembler pseudo-ops and directives. Debugging and testing techniques, interfacing a high level language with an assembly language, Chip level programming of microprocessor type systems, Topics covered include I/O ports, I/O devices and controllers, DMA channels, priority.

2- Overall Aims of the Course:

- ✓ Prepare students to analyze, design and implement digital circuits.
- ✓ Develop students' knowledge about the design principles of digital system and its applications in the computer system.

- ✓ Develop students' knowledge about the fundamental principles of computer architecture used to design microprocessors and microcomputers.
- ✓ Provide students with the basic concepts of instruction set architecture and related design principles.

3- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Explain the principles, theories, techniques and applications of digital circuits.

a2. Explain different techniques of the Register Transfer Language (RTL).

a3. Explain the principles, techniques and applications of computer organization, microprocessors and microcontrollers.

a4. Explain the complete design of the basic computer.

a5. Describe Intel 80x86 based microprocessors including the assembly language.

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Apply mathematical background for analysis and design of digital circuits.

b2. Use software tools to design digital circuits.

b3. Create different micro-operations based on the RTL for the instruction set of the basic computer.

b4. Design the complete basic computer.

b5. Establish an assignment report on the selected topics of the course.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Apply theories and techniques of mathematics to solve digital circuit problem.

c2. Build the appropriate digital circuits to design the required digital system.

c3. Develop the design and implementation of digital circuits using software tools.

c4. Argue datasheets and perform appropriate specifications for required digital circuits.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Effectively manage tasks, time, and resources.

d4. Search for information and engage in life-long self-learning discipline.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	**Digital circuits and Digital Components:** Combinational Circuits, sequential circuits, state table and transition diagram, different registers and universal shift register, ripple and synchronous counters, miscellaneous topics: adders, subtractors, decoders, coders, multiplexer/demultiplexer.	6	4	10
2	**Memory and Programmable integrated circuits:** Memory components and organization, Different types of the random access memory, Memory decoding, write and read Operations, Different types of the read only memory, Programmable integrated circuits.	6	4	10
3	**Register Transfer Language (RTL):** Register transfer and micro-operations, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, design of the arithmetic logic shift unit.	6	4	10
4	**Basic Computer Organization and Design:** Instruction codes, Computer registers and instructions, Timing and control, Instruction cycle, Instruction types: Memory-reference instructions, Register-reference instructions, Input/output instructions and interrupt.	9	6	15
5	**Complete Computer Description and design of basic computer:** Design of control unit, Design of accumulator, Control memory, Address sequencing, mapping of instruction and addressing modes, Input-Output Organization: I/O Bus and interface modules. I/O versus Memory Bus. Priority Interrupt. Direct Memory Access (DMA).	9	6	15
6	The architecture of the Intel 80x86 based microprocessors including the assembly language.	9	6	15
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

4- Lab/Computer/ project Work

The ability to apply specific digital circuits gained in the area of the course to design, simulate, and implement based on the Field Programmable Gate Array (FPGA) software tool.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment:

- Final exam: 40%
- Semester work:
  - In Class Quizzes and Participations 20%
  - Mid-Term Exams 30%
  - Report or project 10%
- **Total 100%**

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

- **Recommended book (text books):** M. Morris Mano, and Michael D. Ciletti; "*Digital Design with an Introduction to the Verilog HDL*"; 5^{th} Edition; Pearson; 2013.
- **Essential books (text books):** M. Morris Mano, *Computer System Architecture*, Prentice Hall, International edition, 1993.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Computer Lab., and Electronics Lab.

Course coordinator:	Associate Prof. Dr. Mohamed H. El-Mahlawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs Electronic & Comm.												
		A10	B01	B03	B04	B10	C01	C03	C04	C12	D01	D03	D06	D07
		Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Think in a creative and innovative way in problem solving and design	Use software tools to develop computer programs for engineering applications.	Write a technical report on a project or an assignment.	Design and integrate digital systems for certain specific function using the appropriate components.	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Design a process, component or system and practice the quality of electronic and communication systems.	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data analyse and interpret results	Read thoroughly datasheets and identify appropriate specifications for required system or device	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a1.													
	a2.													
	a3.													
	a4.													
	a5.													
	b1.													
	b2.													
	b3.													
	b4.													
	b5.													
	c1.													
	c2.													
	c3.													
	c4.													
	d1.													
	d2.													
	d3.													
	d4.													

		Program ILOs Electric Power									
		A12	B03	B06	C01	C03	C04	D01	D03	D06	D07
		Principles, theories and techniques in the field of logic circuit design, digital circuits and systems, computer organization, microprocessors and programmable	Think in a creative and innovative way in problem solving and design	Analyze and design logic circuits, digital circuits, computer and microprocessor systems and PLC's	Apply theories and techniques of mathematics, basic sciences and information technology to solve electronic and communication systems problems.	Use computational facilities and related software tools, measuring instruments, workshops and/or relevant laboratory equipment to design and diagnosis experiments, collect data analyse and interpret results.	Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources	Search for information and engage in life-long self-learning discipline
Course ILOs	a6.										
	a7.										
	a8.										
	a9.										
	a10.										
	b1.										
	b2.										
	b3.										
	b4.										
	b5.										
	c1.										
	c2.										
	c3.										
	c4.										
	d5.										
	d6.										
	d7.										
	d8.										

Table (2): Course Content/Course ILOs Matrix

	Course ILOs																	
	Knowledge & Understanding					Intellectual Skills					Practical Skills				General Skills			
Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4

Digital circuits and Digital Components: Combinational Circuits, sequential circuits, state table and transition diagram, different registers and universal shift register, ripple and synchronous counters, miscellaneous topics: adders, subtractors, decoders, coders, multiplexer/demultiplexer.																		
Memory and Programmable integrated circuits: Memory components and organization, Different types of the random - access memory, Memory decoding, write and read Operations, Different types of the read only memory, Programmable integrated circuits.																		
Register Transfer Language (RTL): Register transfer and micro-operations, Bus and memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, design of the arithmetic logic shift unit.																		
Basic Computer Organization and Design: Instruction codes, Computer registers and instructions, Timing and control, Instruction cycle, Instruction types: Memory-reference instructions, Register-reference instructions, Input/output instructions and interrupt.																		
Complete Computer Description and design of basic computer: Design of control unit, Design of accumulator, Control memory, Address sequencing, mapping of instruction and addressing modes, Input-Output Organization: I/O Bus and interface modules. I/O versus Memory Bus. Priority Interrupt. Direct Memory Access (DMA).																		
The architecture of the Intel 80x86 based microprocessors including the assembly language.																		

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs			
	Knowledge & Understanding	Intellectual Skills	Practical Skills	General Skills

Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecture																		
Discussion																		
Problem Solving																		
Experimental Learning																		
Cooperative Learning																		
Research																		
Project																		

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																	
	Knowledge & Understanding					Intellectual Skills					Practical Skills				General Skills			
Assessment Method	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams																		
Lab Report and Discussion																		
Relative weight %	40%					40%					10%				10%			

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

CMP 351: Microprocessors and Applications

Program (s) on which the course is given:	B.Sc. in Electrical Power Engineering, and B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	3rd level – 6th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Microprocessors and Applications **Code: CMP 351**

Credit Hours: **3 Cr. Hrs.**
Lecture: **3 Hrs. /week**
Tutorial/Lab: **2 Hrs. /week**
Total: **5 Hrs. /week**
Prerequisite: CMP 334 Digital Systems and Computer Organization.

B- Professional Information

1- Catalogue Course Description:
Introduction to microprocessors, Architecture, Microprocessor hardware, Assembly language fundamentals, Programming, Microprocessor system connections, Timing in microprocessors, Interrupts and interrupt service procedures, Microprocessor timing specifications, Interfacing, Programmable chips , Data acquisition systems, Applications of closed loop control, I/O hardware alternatives, Developments tools, Troubleshooting case studies.

Overall Aims of the Course:

The overall aims of the course are:

- ✓ Enrich students' knowledge about micro-architectural features of advanced processors, high-performance, memory design, interfacing techniques and related standards.
- ✓ Train students' to develop microprocessor-based systems.

2- Intended Learning Outcomes (ILOs) of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Define microprocessor architecture, its instructions and addressing modes.

a2. Identify microprocessor signals, bus cycles and timing

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Design a memory system and I/O circuit interface and interface them to a microprocessor.

b2. Design a system using an interrupt interface for a microprocessor.

b3. Analyze a microprocessor program and develop an assembly language programs for applications.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Use programmable interface controllers and programmable timers in a digital circuit.

c2. Use debug tool (DEBUG) microprocessor architecture, software and hardware development.

c3. Use logic analyser for understanding timing, hardware development, and for exploring the relationship between hardware and software of a microprocessor system.

d- General and Transferable Skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team

d2. Communicate effectively.

d3. Demonstrate efficient IT capabilities.

d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction to Computing	3	2	5
2	The AVR Microcontrollers history and features	3	2	5
3	The AVR Architecture and Assembly language	12	8	20
4	Branch, Call, and Time Delay Loop	3	2	5
5	AVR I/O Port Programming	3	2	5
6	Arithmetic and Logic Instructions	6	4	10
7	AVR Advanced Assembly Programming and AVR Programming in C	9	6	15
8	AVR Interrupt programming	6	4	10
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

3- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Communication lab	Programs including arithmetic and logical operations.
Experiment#2	Communication lab	Programs including timing processes.
Experiment#3	Communication lab	Programs including scanned display.
Experiment#4	Communication lab	Programs including external Interrupt.
Experiment#5	Communication lab	Programs including internal Timers.
Experiment#6	Communication lab	Programs including ADC
Experiment#7	Communication lab	Interfacing microcontroller with external devices.

4- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

5- Assessment

- Final exam:..40%
- Semester work:
  - In Class Quizzes and participations........................20%
  - Mid-Term Exams........................30%
  - Electronic and computer Lab Experiments 10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

6- List of references:

✓ **Recommended book** (text books): 8808 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications (4th Edition), Walter A. Triebel and Avtar Singh, ISBN: 0-13-093081-4, Prentice Hall, 2003.

7- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronic and computer Lab.

Course coordinator:	Prof. Dr. Mohamed EL-Mahalawy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs (Electronics & Communication)								
		A10	B01	B03	B10	C04	D01	D03	D04	D06
		Principles, theories, techniques and applications of digital circuits and systems, computer organization, microprocessors and microcontrollers.	Think in a creative and innovative way in problem solving and design.	Use software tools to develop computer programs for engineering applications.	Design and integrate digital systems for certain specific function using the appropriate components.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Demonstrate efficient IT capabilities.	Effectively manage tasks, time, and resources
Course ILOs	a1.									
	a2.									
	b1.									
	b2.									
	b3.									
	c1.									
	c2.									
	c3.									
	d1.									
	d2.									
	d3.									
	d4.									

Table (1-B): Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs (Electric Power) A12: logic circuit design, digital circuits and systems, computer organization, microprocessors and programmable logic controllers (PLC).	B03: Think in a creative and innovative way in problem solving and design.	B02: Develop and implement simple computer programs for engineering applications.	B06: Analyze and design logic circuits, digital circuits, computer and microprocessor systems and PLC's.	C04: Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis	D01: Collaborate effectively within multidisciplinary team.	D03: Communicate effectively.	D04: Demonstrate efficient IT capabilities.	D06: Effectively manage tasks, time, and resources
a3.	■								
a4.	■								
b1.		■		■					
b2.		■		■					
b3.		■	■						
c1.					■				
c2.					■				
c3.					■				
d5.						■			
d6.							■		
d7.								■	
d8.									■

Table (2): Course Content/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills			
Topic	a1	a2	b1	b 2	b3	c1	c2	c3	d1	d2	d3	d4
Introduction to Computing	■											
The AVR Microcontrollers history and features		■	■	■								
The AVR Architecture and Assembly language		■	■	■				■	■	■		
Branch, Call, and Time Delay Loop		■		■				■	■	■		

	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
AVR I/O Port Programming	■		■		■		■		■	■	■	
Arithmetic and Logic Instructions	■		■		■		■					
AVR Advanced Assembly Programming and AVR Programming in C	■				■				■		■	■
AVR Interrupt programming	■			■	■	■			■		■	

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills			
Learning/Teaching Method	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■							
Discussion	■	■	■	■	■					■		
Problem Solving			■	■	■							
Experiential Learning						■	■	■		■	■	■
Cooperative Learning									■			

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs											
	Knowledge & Understanding		Intellectual Skills			Practical Skills			General Skills			
Assessment Method	a1	a2	b1	b2	b3	c1	c2	c3	d1	d2	d3	d4
Written Exams	■	■	■	■	■							
Lab Report and Discussion						■	■	■	■	■	■	■
Relative weight %	30%		40%			20%			10%			

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

CMP 371: Control Systems 1

Programme(s) on which the course is given: B.Sc. in Electronic & Communication Engineering and B.Sc. in Electrical Power Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering
Department offering the course: Electrical Engineering
Academic level/ semester: Level 3 – 6^{th} semester
Date of specification approval: November 2017

A- Basic Information

Title: **Control Systems (1)**
Code: **CMP 371**
Credit Hours: **3 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **2 Hrs.**
Total: **5 Hrs.**
Prerequisite: MTH 212 Transformations and Numerical Analysis

B- Professional Information

1- Catalogue Course Description:

Introduction to control systems, Advantages of closed-loop feedback systems, The role of the system mathematical model, Block diagrams and signal flow graphs, The basic control system design problem, stability in control systems, Frequency response analysis techniques, Root-locus analysis, Elementary lead-lag compensation, Examples on continuous control systems, Transient response, Static error analysis, Frequency response, Polar plots, Logarithmic plots, Relative stability, Root locus, Compensation in frequency domain.

2- Overall aims of the course:

The overall aims of the course are:

- Enrich students' knowledge about theory of classical LTI control systems.
- Train student to analyze and enhance the performance of control systems.

3- Intended learning outcomes of course (ILOs):

a- <u>Knowledge and understanding:</u>
By the end of this course the student should be able to:

a1. Recognize the design problems of closed loop feedback control systems.
a2. Illustrate the Mathematical Modeling of different analog control system.
a3. Explain the different frequency response analysis techniques.
a4. Discuss the modeling and analysis using state space representation.

b- <u>Intellectual skills:</u>
By the end of this course the student should be able to:

b1. Think in a creative way to solve control systems problems.
b2. Apply appropriate mathematical models to design control system.
b3. Analyze control systems using appropriate methods.
b4. Write a technical report on an assignment.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

Period	Topic	Lecture (hours)	Tutorial (hours)	Total (hours)
Week 1	Mathematical Modeling of Control Systems	3	2	**5**
Week 2	Mathematical Modeling of Electrical and Mechanical Systems	3	2	**5**
Week 3	Transient and Steady-State Response Analysis	3	2	**5**
Week 4	The Root Locus Methods	3	2	**5**
Week 5	Design Based on The Root Locus Methods	3	2	**5**
Week 6	Design Based on The Root Locus Methods	3	2	**5**
Week 7	Bode Diagrams	3	2	**5**
Week 8	Bode Diagrams	3	2	**5**
Week 9	Design Based on Bode Diagrams	3	2	**5**
Week 10	State Space Representation and Analysis	3	2	**5**
Week 11	Pole Placement Design	3	2	**5**
Week 12	State Observers	3	2	**5**
Week 13	State Observers	3	2	**5**
Week 14	Servo Systems	3	2	**5**
Week 15	Servo Systems	3	2	**5**
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Learning/Teaching Methods:

6.1- Interactive Lecturing.
6.2- Discussion.
6.3- Problem Solving.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes..10%
  - Participations..10%
  - Reports..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

1) Course Notes (in MS Power Point or PDF format)
2) Essential Book (Text Book)
   - Modern Control engineering, K. Ogata, 5th edition or higher, 2010, Prentice Hall.
3) Recommended Books
   - Automatic Control Systems, B. C. Kuo and F. Golnaraghi, 9th edition or higher, 2010, John Wiley & Sons, Inc.
   - Modern Control Systems, R. C. Dorf, R. H. Bishop, 12th edition or higher, 2010, Prentice Hall
   - Automatic Control Systems with MatlaB programs, S. Hasan Saeed, 2013.
   - Control Systems Engineering, N. S. Nise, 6th edition or higher, 2010, John Wily
4) Periodicals, Web Sites, … etc

9. Facilities required for teaching and learning:

1) White board.
2) Data show for presentations.
3) Electrical Engineering Library.

Course coordinator: **Dr. Said Fouad**
Head of Department: **Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs (Electronics & Communication)			
		A11	B1	B4	B6
		Principles, theories, and techniques of classical and modern control systems.	Think in a creative and innovative way in problem solving and design.	Plan, conduct and write a technical report on a project or an assignment	Apply different theories and techniques to solve problems of classical and modern control systems.
Course ILOs	a1.				
	a2.				
	a3.				
	a4.				
	b1.				
	b2.				
	b3.				
	b4.				

Table (1-B): Course ILOs/ Program ILOs Matrix

Course ILOs	Program ILOs (Electric Power) A13: Principles, theories, and techniques of classical and modern control systems.	B03: Think in a creative and innovative way in problem solving and design.	B7: Apply different theories and techniques to solve problems of classical and modern control systems.
a5.			
a6.			
a7.			
a8.			
b1.			
b2.			
b3.			
b4.			

Table (2): Course Contents/Course ILOs Matrix

Topic	Knowledge & Understanding				Intellectual			
	a1	a2	a3	a4	b1	b2	b3	b4
Mathematical Modeling of Control Systems								
Mathematical Modeling of Electrical and Mechanical Systems								
Transient and Steady-State Response Analysis								
The Root Locus Methods								
Design Based on The Root Locus Methods								
Bode Diagrams								
Design Based on Bode Diagrams								
State Space Representation and Analysis								
Pole Placement Design								
State Observers								
Servo Systems								

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs							
	Knowledge & Understanding				Intellectual Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	b4
Interactive Lecturing								
Discussion								
Problem Solving								

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs							
	Knowledge & Understanding				Intellectual Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	b4
Written Exams								
Discussion and Participation								
Report								
Relative weight %	40%				60%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

CMP 472: Control Systems (2)

Programme(s) on which the course is given:
Electronics & Communication Engineering and Electric Power Engineeing

Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic year/Level:	4^{th} Level –
Date of specification approval:	November 2017

A- Basic Information

Title: Control Systems (2) **Code: CMP 472**

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**
Prerequisite:	CMP 371: Control systems (1)

B- Professional Information

1- Catalog Course Description:

Optimal control of continuous systems, Stability of closed loop systems, Discrete control systems, Z-Transform, Modified Z-Transform, Impulse T.F., Static error, Jury stability analysis, Frequency response, Classical design of D.T.C. system, Design of D.T.C. with dead zone.

2- Overall aims of the course:

The Main Goals of this course are:

- Develop student knowledge about the fundamentals of digital control systems.
- Prepare students to analyse and design digital control systems.
- Train students to evaluate the performance of digital control systems.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:
By the end of this course the student should be able to:

a1. Explain the fundamentals of z-transform technique and digital control systems.
a2. Demonstrate the principles of stability analysis and steady-state errors of digital control systems.

b- Intellectual skills:
By the end of this course the student should be able to:
b1. Apply z-transform technique for solving digital control system design problems.
b2. Design and analyze the performance of digital control systems.
b3. Evaluate the stability test of digital control systems.
b4. Use software tools in designing and evaluating digital control systems.

4- Course ILOs versus Program ILOs relation
See Appendix, table [1]

5- Course Contents:

#	Topics	Lec.	Tut.	Total
1	Digital control systems definition	3	2	5
2	Z-transform properties and theorems	6	4	10
3	Inverse Z-transform using different methods	6	4	10
4	Impulse sampling and data hold	3	2	5
5	Pulse transfer function	6	4	10
6	Mapping between the s-plane and z-plane and Jury stability analysis	6	4	10
7	Transient and steady-state response, error analysis	9	6	15
8	Design based on the root-locus method	6	4	10
Total		**45**	**30**	**75**

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:
See Appendix, table [3]

7- Assessment

- Final exam:....................40%
- Semester work:
  - Mid-Term exams....................30%
  - In Class Quizzes....................10%
  - Performance/Attendance....................20%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book:
   Katsuhiko Ogata, *Discrete-Time Control Systems*, Prentice-Hall International, Inc., 2nd edition, 1995.

Facilities required for teaching and learning:

- White board.
- Data show for presentations.

Course coordinator:	**Dr. Waleed Al-Hanafy**
Head of Department:	**Dr. Kamel Mohamed Hassan**
Date:	**November - 2017**

Appendix

Table (1-A): Course ILOs/Program ILOs Matrix

		Program ILOs (Electronic & Communication				
		A5	A11	B1	B3	B6
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Principles, theories, techniques and applications of classical and modern control systems.	Think in a creative and innovative way in problem solving and design.	Use software tools to develop computer programs for engineering applications.	Apply different theories and techniques to model, evaluate the characteristics and solve problems of classical and modern control systems.
Course ILOs	a1.					
	a2.					
	b1.					
	b2.					
	b3.					
	b4.					

Table (1-B): Course ILOs/Program ILOs Matrix

		Program ILOs			
		A1	A13	B3	B7
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Principles, theories, techniques and applications of classical and modern control systems.	Think in a creative and innovative way in problem solving and design.	Apply different theories and techniques to model, evaluate the characteristics and solve problems of classical and modern control systems.
Course ILOs	a3.	■			
	a4.		■		
	b1.				■
	b2.			■	■
	b3.			■	■
	b4.			■	

Table (2): Course Contents/Course ILOs

Topic	a1	a2	b1	b2	b3	b4
Digital control systems definition	■					
Z-transform properties and theorems	■					■
Inverse Z-transform using different methods	■					■
Impulse sampling and data hold	■	■				
Pulse transfer function	■	■	■			■
Mapping between the s-plane and z-plane and Jury stability analysis		■		■	■	■
Transient and steady-state response, error analysis		■	■	■	■	■
Design based on the root-locus method				■		

Table (3): Teaching Methods/Course ILOs Matrix

Topic	a1	a2	b1	b2	b3	b4
Interactive Lecturing	■	■	■	■	■	■
Discussion	■	■	■	■	■	■
Problem Solving			■	■	■	■

Table (4): Assessment Methods/Course ILOs Matrix

Topic	a1	a2	b1	b2	b3	b4
Assignments						
Quizzes						
Midterm & Final Exam						
Overall Percentage	20%	20%	20%	20%	10%	10%

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 261: Electrical Circuits (1)

Programme(s) on which the course is given:	B.Sc. in Electronic and Communication Engineering and Electrical Power Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level Two – 3rd semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electrical Circuits (1) **Code: EPR 261**

Credit Hours: **4 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **3 Hrs.**
Total: **6 Hrs.**
Prerequisite: PHY 132: Physics 2

B- Professional Information

1- Catalogue Course Description:

Basic electrical quantities, Ohm's Law and Kirchhoff's Laws, resistance and source combinations, voltage and current division. Techniques of solving DC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thévenin's theorem. AC sinusoidal sources, time domain and frequency domain, voltages and currents phasor diagrams, inductance and capacitance: the between voltage and current relationships, impedance and admittance, Techniques of solving AC electric circuits: nodal and mesh analysis, source transformation. Theorems: superposition, and Thévenin's theorem. Steady state power analysis is described for sinusoidal sources.

2- Overall aims of the course:

The Main Goals of this course are:

- To understand the fundamentals of electrical circuits.
- To know the main components used of electrical circuits.
- To analyze DC/AC electrical circuits using different techniques and theorems.
- To develop practical skills of testing electrical components.

- To share ideas and work in a team or a group.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Demonstrate knowledge and understanding functions of components and concepts electrical circuits including Ohm's Law, Kirchhoff's Laws, resistance and source combinations, and voltage and current division.
a2. Illustrate solving techniques of electrical circuits including nodal and mesh analysis and source transformation.
a3. Describe theorems for solving electrical circuits including superposition, and Thévenin's theorem.
a4. Illustrate the characteristics of inductance and capacitance.
a5. Define the impedance, admittance, and phasors for AC electric circuits.
a6. Illustrate solving techniques and theorems of solving AC electric circuits.

b- Intellectual skills:

By the end of this course the student should be able to:
b1. Ability to apply different techniques and theorems for solving electric circuits.
b2. Choose among different solution alternatives.
b3. Compare between solutions of AC and DC circuits.

c- Professional and practical skills:

By the end of this course the student should be able to:
c1. Testing electrical components.
c2. Implementation for simple electrical circuits.
c3. Applying solution techniques on simple circuits in the lab.

d- General and transferable skills:

By the end of this course the student should be able to:
d1. Work coherently and successfully as a part of a team in the Lab.
d2. Communicate effectively.
d3. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Basic concepts, components of Electric Circuits.	3	3	6
2	Basic laws , and voltage and current division.	6	6	12
3	Techniques of DC circuit analysis.	9	9	12
4	Theorems of DC circuit analysis.	6	6	12
5	AC sinusoidal sources, Time domain and frequency domain	3	3	6
6	Inductance and Capacitance	6	6	12
7	Phasor and impedance	6	6	12
8	Techniques and Theorems of AC circuit analysis.	6	6	12
Total		**45**	**45**	**90**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Elect. Eng. Fundamentals Lab	Ohm's Law, Kirchhoff's voltage and current laws, voltage and current divisions, and equivalent resistance.
Experiment#2	Elect. Eng. Fundamentals Lab	Superposition Theorem, Thévenin's Theorem, and Maximum Power Transfer Theorem.

6- Learning/Teaching Methods:

6.1- Lectures.
6.2- Tutorials.
6.3- E-Learning Program.
6.4- Laboratories.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
    - Mid-Term exams..............................30%
    - In Class Quizzes.............................10%
    - Participations...............................10%
    - Lab...10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1. Fundamentals of Electric Circuits", C.K. Alexander and M.N.O. Sadiku, McGraw Hill, 4th edition, 2009.Students Lecture Notes (**Text Book**).
2. "Basic Engineering Circuit Analysis", J. D. Irwin, Fourth edition, Macmillan, most recent edition.
3. "Electric Circuits", James W. Nilsson and Susan A. Riedel, Addison Wesley, most recent edition.Ramsey.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical Engineering Library.
- Elect. Machines Lab.

Course coordinator: **Dr. Moneer M. Abu-Elnaga**
Head of Department: **Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs Electronic & Communication							
		A5	A6	B5	C4	C10	D1	D3	D6
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems.	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Prepare and present technical reports.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a1.								
	a2.								
	a3.								
	a4.								
	a5.								
	a6.								
	b1.								
	b2.								
	b3.								
	c1.								
	c2.								
	c3.								
	d1.								
	d2.								
	d3.								

Table (1-B): Course ILOs/ Program ILOs Matrix

		Program ILOs Electric Power								
		A1	A11	B4	C3	C8	C10	D1	D3	D6
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on	Fundamentals of electrical engineering including DC/AC electrical circuits, electronic devices and circuits, electromagnetic fields, and electrical and electronic	Apply different theories and techniques to analyze DC/AC circuits.	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Prepare and present technical reports.	Perform experiments, collect, analyze and interpret results of DC/AC circuits, electronic components and circuits, and electrical and electronic instruments.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a7.									
	a8.									
	a9.									
	a10.									
	a11.									
	a12.									
	b1.									
	b2.									
	b3.									
	c1.									
	c2.									
	c3.									
	d4.									
	d5.									
	d6.									

Table (2): Course Contents/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Basic concepts, components of Electric Circuits.	■									■					
Basic laws, and voltage and current division.	■									■	■		■	■	■
Techniques of DC circuit analysis.		■					■	■							
Theorems of DC circuit analysis.			■				■	■				■	■	■	■
AC sinusoidal sources, Time domain and frequency domain					■										
Inductance and Capacitance				■											
Phasor and impedance					■							■			
Techniques and Theorems of AC circuit analysis.						■	■	■	■			■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Interactive Lecturing	■	■	■	■	■	■	■	■	■						
Discussion							■	■	■						
Problem solving							■	■	■						
Experiential learning										■	■	■	■	■	■
Cooperative learning										■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding						Intellectual Skills			Practical Skills			General Skills		
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	c1	c2	c3	d1	d2	d3
Written Exams	■	■	■	■	■	■	■	■	■						
Discussion and Participation							■	■	■	■	■	■	■	■	■
Lab work and Report										■	■	■	■	■	■
Relative weight %	20%						60%			10%			10%		

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 263: Electrical Circuits (2)

Programme(s) on which the course is given:	B.Sc. in Electronic and Communication Engineering and Electrical Power Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level Two– 4th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electrical Circuits (1) **Code: EPR 261**

Credit Hours: **4 Cr. Hrs.**
Lectures: **3 Hrs.**
Tutorial/Lab: **3 Hrs.**
Total: **6 Hrs.**
Prerequisite: EPR 261: Electrical Circuits (1)

B- Professional Information

1- Catalogue Course Description:

Transient analysis in R-L, R-C, and RLC circuits. Steady state power analysis for circuits with sinusoidal sources. Maximum power transfer theorem. Three phase circuits; connections, transformations, and power measurements. Magnetically coupled circuits: linear transformer equivalent circuits, ideal transformer. Frequency response, Series and parallel resonance circuits, Quality factor, 3 dB bandwidth, Resonance in mutually coupled circuits.

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

- understand the transient performance of 1st and 2nd order circuits.
- develop the steady state power analysis for circuits with sinusoidal sources and apply maximum power transfer theorem on AC electrics.
- understand the operation of 3-phase circuits with different connections.
- know the performance of magnetically coupled circuits and linear transformers.

- understand the frequency response of circuits supplied by a variable frequency sources and the concepts of resonance circuits.
- develop practical skills of testing 1st and 2nd order circuits during transient, 3-phase circuits.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Demonstrate the transient performance of 1st order and 2nd order electrical circuits.
a2. Demonstrate knowledge and understanding of AC power analysis.
a3. Describe three phase circuits with different connections.
a4. Understand magnetically coupled circuits.
a5. Illustrate the frequency response of resonant circuits.
a6. Establish the equivalent circuits of different two-port networks.

b- Intellectual skills:

By the end of this course the student should be able to:

b1. Evaluate the transient performance of 1st and 2nd order circuits.
b2. Perform basic calculations of AC power analysis.
b3. Examine different connections of three phase circuits.
b4. Perform basic calculations of magnetically coupled circuits.
b5. Evaluate the frequency response of resonant circuits.

c- Professional and practical skills:

By the end of this course the student should be able to:

c1. Develop practical skills of testing 1st and 2nd order circuits during transient.
c2. Practice basic experiments on 3-phase circuits.
c3. Test the frequency response of resonant circuits.

d- General and transferable skills:

By the end of this course the student should be able to:

d1. Work coherently and successfully as a part of a team in the Lab.
d2. Communicate effectively.
d3. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Revision on Electric Circuits 1	3	3	6
2	Transient analysis in R-L and R-C circuits.	9	9	18
3	Transient analysis in RLC circuits.	6	6	12
4	Steady state power analysis for AC circuits.	6	6	12
5	Three phase circuits.	6	6	12
6	Magnetically coupled circuits	6	6	12
7	Frequency response and resonance circuits.	6	6	12
8	Two-port networks.	3	3	6
Total		**45**	**45**	**90**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Elect. Eng. Fundamentals Lab	Transient Analysis of RL, RC, and RLC Circuits
Experiment#2	Electric Machines Lab	Three-Phase Circuits

6- Learning/Teaching Methods:

6.1- Lectures.
6.2- Tutorials.
6.3- E-Learning Program.
6.4- Laboratories.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes..10%
  - Participations..10%
  - Lab..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1. Fundamentals of Electric Circuits", C.K. Alexander and M.N.O. Sadiku, McGraw Hill, 4th edition, 2009.Students Lecture Notes (**Text Book**).
2. "Basic Engineering Circuit Analysis", J. D. Irwin, Fourth edition, Macmillan, most recent edition.
3. "Electric Circuits", James W. Nilsson and Susan A. Riedel, Addison Wesley, most recent edition.Ramsey.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical Engineering Library.
- Elect. Eng. Fundamentals Lab and Elect. Machines Lab.

Course coordinator:	**Dr. Moneer M. Abu-Elnaga**
Head of Department:	**Dr. Kamel Hassan**
Date:	**November 2017**

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs Electronic & Communication							
		A5	A6	B5	C4	C10	D1	D3	D6
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering.	Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems.	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Prepare and present technical reports.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a1.								
	a2.								
	a3.								
	a4.								
	a5.								
	a6.								
	b1.								
	b2.								
	b3.								
	c1.								
	c2.								
	c3.								
	d1.								
	d2.								
	d3.								

Table (1-B): Course ILOs/ Program ILOs Matrix

		Program ILOs Electric Power								
		A1	A11	B4	C3	C8	C10	D1	D3	D6
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on	Fundamentals of electrical engineering including DC/AC electrical circuits, electronic devices and circuits, electromagnetic fields, and electrical and electronic	Apply different theories and techniques to analyze DC/AC circuits.	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Prepare and present technical reports.	Perform experiments, collect, analyze and interpret results of DC/AC circuits, electronic components and circuits, and electrical and electronic instruments.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a7.		■							
	a8.	■	■							
	a9.		■							
	a10.		■							
	a11.		■							
	a12.	■	■							
	b1.			■						
	b2.			■						
	b3.			■						
	c1.				■					
	c2.				■	■				
	c3.				■	■	■			
	d4.							■		
	d5.								■	
	d6.									■

Table (2): Course Contents/Course ILOs Matrix

	Course ILOs																
	Knowledge & Understanding						Intellectual Skills					Practical Skills			General Skills		
Topic	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3
Transient analysis in R-L and R-C circuits.	■						■					■	■	■	■	■	■
Transient analysis in RLC circuits.	■						■										
Steady state power analysis for AC circuits.		■						■				■	■	■	■	■	■
Three phase circuits.			■						■								
Magnetically coupled circuits				■						■							
Frequency response and resonance circuits.					■						■						
Two-port networks.						■											

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs																
	Knowledge & Understanding						Intellectual Skills					Practical Skills			General Skills		
Learning/Teaching Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3
Interactive Lecturing	■	■	■	■	■	■	■	■	■	■	■						
Discussion							■	■	■	■	■						
Problem solving							■	■	■	■	■						
Experiential learning												■	■	■	■	■	■
Cooperative learning												■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs																
	Knowledge & Understanding						Intellectual Skills					Practical Skills			General Skills		
Assessment Method	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3
Written Exams	■	■	■	■	■	■	■	■	■	■	■						
Discussion and Participation							■	■	■	■	■	■	■	■	■	■	■
Lab work and Report												■	■	■	■	■	■
Relative weight %	20%						60%					10%			10%		

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 341: Energy Systems

Programme(s) on which the course is given:	Electronic and Communication Engineering and Electrical Power Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level 3– 5th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Energy Systems **Code: EPR 341**

Credit Hours: **3 Cr. Hrs.**

Lectures: **3 Hrs.**

Tutorial/Lab: **2 Hrs.**

Total: **5Hrs.**

Prerequisite: EPR 263 - Electric Circuits 2

B- Professional Information

1- Catalogue Course Description:

Energy resources and electric power generation, Power system structure: generation, transmission and distribution, Power system components: generators, transformers, transmission lines and circuit breakers. Fault analysis and Power flow.

2- Overall Aims of the Course:

Upon successful completion of the course, the student should be able to:

1. Understand and differentiate between different energy resources.
2. Know the structure and performance of electrical transmission lines.
3. Identify the different protective schemes used in electrical power systems.

3- Intended Learning Outcomes of Course (ILOs):

On completing this course, students will be able to:

a- Knowledge and understanding:

a-1- Demonstrate knowledge and understanding of the construction of electric machines

a-2- Demonstrate knowledge and understanding of the principles and theories of the characteristics of different types of generators and transformers

a-3-Explain the techniques of protections in power systems

a-4-Explain the power flow and stability of power systems

b- Intellectual skills:

b-1-Suggest solutions to control power output of synchronous machines

b-2-Compare different power flow methods of power systems

b-3-Modify the protection of different components of power systems

c- Professional and Practical skills:

c1-Calculate the transformer equivalent circuit parameters from tests data

c2-Suggest appropriate decisions for selecting the parameters of transmission lines

c3-Evaluate methods of protection in different components of power system

d- General and transferable skills:

d1. Collaborate effectively within team.

d2. Effectively manage tasks, time, and resources.

d3. Communicate effectively

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction & Three-phase systems	3	2	5
2	Synchronous Alternators	6	6	12
3	Transformers	9	6	15
4	Transmission Lines	9	6	15
5	Protection	9	4	13
6	Power Flow	3	2	5
7	Fault Analysis	3	2	5
8	Stability	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Electrical Machines Lab	Characteristics of 1-phase transformer
Experiment#2	Electrical Machines Lab	Characteristics of 3-phase alternator

6- Learning/Teaching Methods:

4.1- Interactive teaching (via lectures and tutorials)
4.2- Discussions and participation (via tutorials)
4.3- small group team work (via laboratories)

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term exams..30%
  - In Class Quizzes...10%
  - Participations..10%
  - Lab..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1- Theodore Wildi, "Electrical Machines, Drives and Power Systems" 6th Edition, Pearson 2005 (Text Book)
2- Stephen J. Chapman, "Electric Machinery Fundamentals", 5th edition BAE System Australia, 2012.
3- Hadi Saadat, "Power System Analysis", 2nd edition, McGraw Hill electrical and electronic engineering series, 2004.
4- Ruben D. Garzon, "High voltage circuit breakers: design and applications", Marcel Dekker, 2002.
5- William D. Stevenson, "Elements of Power System Analysis", McGraw Hill electrical and electronic engineering series, 4th edition, 1990.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical Engineering Library.
- Elect. Machines Lab.

Course coordinator: **Dr. Walid Atef Omran**
Head of Department: **Dr. Kamel Hassan**
Date: November 2017

Appendix

Table (1-A): Course ILOs/ Program ILOs Matrix

		Program ILOs Electronics & Communication							
		A06	B01	B05	C6	C10	D1	D3	D6
		Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems	Think in a creative and innovative way in problem solving and design	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines.	Follow up safety requirements at work and observe the appropriate steps to manage risks	Prepare and present technical reports.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
Course ILOs	a1								
	a2								
	a3								
	a4								
	b1								
	b2								
	b3								
	c1								
	c2								
	c3								
	d1								
	d2								
	d3								

Table (1-B): Course ILOs/ Program ILOs Matrix

	Program ILOs Electric Power									
	A14	A16	B9	B10	C6	C8	C13	D1	D3	D6
Course ILOs	Construction, theory of operation, equivalent circuit, and performance of DC machines, transformers, synchronous machines, and induction machines.	Principles, construction and applications of electric power components including overhead lines, underground cables, insulators, switchgear, relays and instrument transformers.	Apply knowledge of DC machines, transformers, synchronous machines, and induction machines to solve and analyze related problems.	Select appropriate mathematical and/or computer-based methods for analyzing: power transmission and distribution, load flow, and economic dispatch	Apply safe systems at work and observe the appropriate steps to manage risks.	Prepare and present technical reports.	analyze and interpret results of performance of DC machines, transformers, synchronous machines, and induction machines.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources.
a5	■									
a6	■									
a7		■								
a8		■								
b1			■							
b2				■						
b3			■							
c1							■			
c2					■					
c3					■	■				
d4								■		
d5										■
d6									■	

Table (2): Course Contents/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
Topic	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Introduction & Three-phase systems	■							■					
Synchronous Alternators	■							■	■		■	■	■
Transformers		■			■	■							
Transmission Lines			■		■	■				■	■	■	■
Protection			■	■									
Power Flow				■									
Fault Analysis		■								■			
Stability	■				■	■	■			■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Interactive teaching/learning (via lectures and tutorials)	■	■	■	■									
Discussions and participation (via tutorials)					■	■	■						
Small group team work (via laboratories)								■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs												
	Knowledge & Understanding				Intellectual Skills			Practical Skills			General Skills		
Assessment Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	d1	d2	d3
Written Exams	■	■	■	■	■	■	■						
Discussion and Participation					■	■	■	■	■	■	■	■	■
Lab work and Report	■							■	■	■	■	■	■
Relative weight %	30%				50%			10%			10%		

جـــــامـــــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 364: Electrical & Electronic Measurements

Program (s) on which the course is given:	B.Sc. in Electrical Power Engineering B.Sc in Electronic & Communication Engineering
Major or minor element of programs:	(Not Applicable)
Department offering the program:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic Level/Semester:	3rd level – 6th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electrical & Electronic Measurements **Code: EPR 364**

Credit Hours:	**3 Cr. Hrs.**
Lecture:	**3 Hrs. /week**
Tutorial/Lab:	**2 Hrs. /week**
Total:	**5 Hrs. /week**

Prerequisite: ELE 213 Electronics & EPR 261 Electric Circuits 1

B- Professional Information

1- Catalogue Course Description:

Introduction to Units, Standards, and Measurements Errors. Electromechanical Instruments and DC meters. Resistance, Inductance and Capacitance measurements, DC/AC bridges. Digital Basic Instruments, Digital counters, A/D & D/A converters. Digital measuring instruments: digital multimeters and frequency meters. Cathode Ray Oscilloscopes and its applications in phase and frequency measurements, Digital Storage Oscilloscopes, Spectrum Analyzer.
Electromechanical Transducers: Variable resistance, capacitance and inductance transducers, Strain Gauge, Linear Variable Differential Transformer.
Temperature Transducers: The Thermocouple and the Thermistor.
Light Transducers: The photoconductive cell and photodiode.

2- Overall Aims of the Course:

- ✓ Develop the students' knowledge about Analog & Digital instruments and transducers.
- ✓ Develop students' practical skills for designing and building up a complete application circuit.
- ✓ Train students to perform basic experiments on Analog & Digital instruments.

3- Intended Learning Outcomes (ILOs)of the course:

a- Knowledge and Understanding:

By the end of this course the student should be able to:

a1. Explain the analog multi-meters and its applications as well as the DC and AC bridges.
a2. Explain digital multi-meters, digital counters, and frequency meters.
a3. Explain the cathode ray oscilloscope and digital oscilloscope and its applications in different measurements.
a4. Explain signal generators and spectrum analyzers.
a5. Classify electrical and electronic transducers

b- Intellectual Skills

By the end of this course the student should be able to:

b1. Prepare a technical report for lab experiments.

b2. Apply different techniques to solve DC/AC circuit problems.

b3. Investigate the failure of the labs equipment and transducers.

c- Professional and Practical Skills

By the end of this course the student should be able to:

c1. Build experiments, and interpret their results using analog & digital measuring instruments and relevant laboratory equipment.

c2. Develop troubleshooting experiments using the laboratory tools in the course project.

c3. Practice main functions of analog & digital instruments and transducers.

c4. Follow up safety requirements at lab.

d- General and Transferable Skills:

By the end of this course the student shouldbe able to:

d1. Collaborate effectively within multidisciplinary team.
d2. Work coherently and successfully as a part of a team in the Lab and assignments.
d3. Effectively manage tasks, time, and resources during the project and lab experiments.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Review on Measurements Units & Errors.	3	2	5
2	Electromechanical Instruments	3	2	5
3	Electromechanical Applications	3	2	5
4	Digital Basics	3	2	5
5	Digital Instruments and Frequency meters	6	4	10
6	Cathode Ray Oscilloscope	9	6	15
7	Digital Oscilloscope.	6	4	10
8	Function Generators & Spectrum Analyzers.	6	4	10
9	Sensors & Transducers	6	4	10
	Total	**45**	**30**	**75**

The course contents are mapped tothe course ILOs inTable (2) in the Appendix.

4- Lab/Computer/ project Work

Activity	Facility	Title
Experiment#1	Electronics Lab	Analog multi-meter applications: Voltmeter, Current meter, Ohmmeter and power meter.
Experiment#2	Electronics Lab	Digital multi-meter applications: Voltmeter, Current meter, Ohmmeter and power meter.
Experiment#3	Electronics Lab	Cathode Ray Oscilloscope applications: Volt, phase, time and frequency measurements.
Experiment#4	Electronics Lab	Digital Oscilloscope applications: Volt, phase, time and frequency measurements.
Experiment#5	Electronics Lab	Signal generator applications: Signal amplitude and frequency measurements.
Experiment#6	Electronics Lab	Spectrum analyzer applications: Signal amplitude and frequency measurements.
Experiment#7	Electronics Lab	Electromechanical transducers: Variable resistance, capacitance transducers, Strain Gauge
Experiment#8	Electronics Lab	Temperature transducers: The Thermocouple and the Thermistor. Light transducers: The photoconductive cell and photodiode.

5- Learning/Teaching Methods:

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

6- Assessment

- Final exam:..40%
- Semesterwork:
  - In Class Quizzes..............................20%
  - Mid-Term Exams..............................30%
  - Lab Experiments& Project..................10%
- **Total..100%**

The assessment methodsare mapped to the course ILOs in Table (4) in the Appendix.

7- List of references:

Essential books (text books): David A. Bell, "Electronic Instrumentation & Measurements" - PHI, 2nd Edition, 2003.

8- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electronics Lab.

Course coordinator:	Dr. Omar Mamdouh Fahmy	
Head of Department:	Prof. Dr. Kamel Hassan	
Date:	November 2017	

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs									
		A9	B4	B5	B12	C4	C7	C11	D1	D3	D6
		Applying of the electrical, electronic, digital instrumentation, sensors and transducers in the biomedical technology.	Write a technical report on a project or an assignment.	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines.	Troubleshoot the failure and develop innovative solution for electronic components, systems, and processes.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory	Follow up safety requirements at work and observe the appropriate steps to manage risks.	Use the standard and appropriate tools to troubleshoot, maintain and repair the electronic systems.	Collaborate effectively within multidisciplinary team.	Communicate effectively.	Effectively manage tasks, time, and resources
Course ILOs	a1.										
	a2.										
	a3.										
	a4.										
	a5.										
	b1.										
	b2.										
	b3.										
	c1.										
	c2.										
	c3.										
	c4.										
	d1.										
	d2.										
	d3.										

Table (2): Course Topics/ Course ILOs Matrix

	Knowledge & Understanding					Intellectual Skills			Practical Skills				General Skills		
Topic	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3
Review on Measurements Units & Errors.	■						■		■						
Electromechanical Instruments	■						■			■					
Electromechanical Applications	■					■	■		■				■	■	■
Digital Basics		■						■		■					
Digital Instruments and Frequency meters		■						■		■					
Cathode Ray Oscilloscope			■					■	■		■	■	■	■	■
Digital Oscilloscope.			■					■	■		■	■	■	■	■
Function Generators& Spectrum analyzer.				■				■	■		■	■	■	■	■
Sensors & Transducers					■	■		■			■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding					Intellectual Skills			Practical Skills				General Skills		
Learning/Teaching Method	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3
Interactive Lecture	■	■	■	■	■										
Discussion					■	■		■							
Problem Solving						■	■	■							
Experimental Learning									■	■	■	■		■	■
Cooperative Learning													■		
Project					■		■				■			■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs															
	Knowledge & Understanding					Intellectual Skills			Practical Skills					General Skills		
Assessment Method	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	c5	d1	d2	d3
Written Exams	■	■	■	■	■	■	■	■								
Lab Report and Discussion									■	■	■	■	■	■	■	■
Relative weight %	40%					40%			10%					10%		

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 441: Electrical Machines

Programme(s) on which the course is given:	B.Sc. in Electronic and Communication Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level Four–7^{th} semester
Date of specification approval:	November 2017

A- Basic Information

Title: Electrical Circuits (1) **Code: EPR 441**

Credit Hours:	**4 Cr. Hrs.**
Lectures:	**3 Hrs.**
Tutorial/Lab:	**2 Hrs.**
Total:	**5 Hrs.**

Prerequisite: EPR 341 - Energy Systems

B- Professional Information

1- Catalogue Course Description:

Magnetic circuits. Construction, theory of operation, equivalent circuit, (voltage, current, power and torque) equations, basic characteristics, performance: efficiency and voltage regulation or speed regulation, and testing (experiments) and of each of the following machines: DC Machines, 1-ph Transformers, 3-ph Induction Motors, and 3-ph Synchronous Machines.

2- Overall aims of the course:

This course aims to:

- Understand the definitions and construction of magnetic circuit.
- Recognize the construction, theory of operation, equivalent circuit, (voltage, current) equations, basic characteristics and testing of **1-ph Transformers**, **DC Machines, 3-ph Induction Motors, and 3-ph Synchronous Machines**
- Develop practical skills and perform the required experiments to get the equivalent circuit parameters and load characteristics of each of the previous machines.
- Share ideas and work in a team or a group.

3- Intended learning outcomes of course (ILOs):

a- <u>Knowledge and understanding:</u>

By the end of this course the student should be able to:

a1- Identify the magnetic circuit definitions and concepts.
a2-Define knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **1-ph Transformers**.
a3- Recognize knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **DC Machines**.
a4- Recognize knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **3-ph Synchronous Machines**.
a5- Define knowledge and understanding of construction, theory of operation, equivalent circuit, and basic characteristics of **3-ph Induction Motors**.

b- <u>Intellectual skills:</u>

By the end of this course the student should be able to:

b1- Analyze and solve operating conditions of **1-ph Transformers**.
b2- Employ and solve operating conditions of **DC Machines**.
b3- Apply and solve operating conditions of **3-ph Synchronous Machines**.
b4- Illustrate and solve operating conditions of **3-ph Induction Motors**.
b5- Decide and chose among different solution alternatives.
b6- Evaluate obtained results both individually or as a part of team.

c- <u>Professional and practical skills:</u>

By the end of this course the student should be able to:

c1- Explore practical skills and perform the required experiments to get the equivalent circuit parameters of **1-ph Transformers**.
c2- Develop practical skills and perform the required experiments to get the load characteristics of **DC Machines**.
c3- Develop practical skills and perform the required experiments to get the equivalent circuit parameters of **3-ph Synchronous Machines**.
c4- Apply practical skills and perform the required experiments to get the load characteristics of **3-ph Induction Motors**.

d- <u>General and transferable skills:</u>

By the end of this course the student should be able to:

d1- Write technical reports in accordance with standard scientific guidelines**.**
d2- Work in a self-directed manner.
d3- Work coherently and successfully as a part of a team in the Lab.
d4- Analyze problems and use innovative thinking in their solution.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Electric power system components	3	2	5
2	3 phase systems	3	2	5
3	Magnetic circuits	6	4	10
4	1- phase transformer & 3-phase transformer	6	4	10
5	D. C. Machines	6	4	10
6	AC Machines	12	8	20
7	Lab session for DC Machine and Transformer	6	4	10
8	Lab session for AC Machines	3	2	5
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Electric Machines Lab	Characteristics of a separately excited DC generator.
Experiment#2	Electric Machines Lab	Equivalent circuit and characteristics of a single-phase transformer.
Experiment#3	Electric Machines Lab	Characteristics of a 3-Phase Squirrel-Cage Induction Motor

6- Learning/Teaching Methods:

6.1- Lectures.
6.2- Tutorials.
6.3- E-Learning Program.
6.4- Laboratories.

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..40%
- Semester work:
    - Mid-Term exams..30%
    - In Class Quizzes..10%
    - Participations..10%
    - Lab..10%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1-"**Electric Machinery fundamentals"**, Chapman, S. J., McGraw Hill Co., 4th edition, 2005. (**Text Book**).

2- "**Principles of Electric Machines with Power Electronic Applications**", M. E. El-Hawary, McGraw-Hill, most recent edition.
3-"**Schaum's Electric Machines and Electromechanics**", by Syed A. Nasar.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical Engineering Library.
- Elect. Machines Lab.

Course coordinator: **Dr. Moneer M. Abu-Elnaga**
Head of Department: **Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs							
		A6	B5	C4	C7	C10	D1	D2	D6
		Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems.	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines.	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analyse and interpret results.	Follow up safety requirements at work and observe the appropriate steps to manage risks..	Edit and present technical report.	Collaborate effectively within multidisciplinary team.	Elements, theories, techniques of analysis of Work in stressful environment and within	Effectively manage tasks, time, and resources.
Course ILOs	a1.	■							
	a2.	■							
	a3.	■							
	a4.	■							
	a5.	■							
	b1.		■						
	b2.		■						
	b3.		■						
	b4		■						
	b5		■						
	b6		■						
	c1.			■	■	■			
	c2.			■	■	■			
	c3			■	■	■			
	c4			■	■	■			
	d1.						■		
	d2.							■	
	d3.								■
	d4.						■		

Table (2): Course Contents/Course ILOs Matrix

Topic	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Magnetic circuits	■									■	■								
1- phase transformer & 3-phase transformer		■				■						■							
D. C. Machines			■				■						■						
AC Machines				■				■	■					■	■				
Lab session for DC Machine and Transformer				■						■	■	■	■			■	■	■	■
Lab session for AC Machines					■					■	■			■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■														
Discussion	■	■	■	■	■	■	■	■	■	■	■								
Problem Solving						■	■	■	■	■	■								
Experiential Learning												■	■	■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Course ILOs																		
	Knowledge & Understanding					Intellectual Skills						Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	b6	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■	■	■	■								
Lab Report and Discussion												■	■	■	■	■	■	■	■
Relative weight %	20%					60%						10%				10%			

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

EPR 442: Actuators and Power Electronics

Programme(s) on which the course is given:	Electronics and Communications Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level Four
Date of specification approval:	November 2017

A- Basic Information

Title: Actuators and Power Electronics **Code: EPR 442**

Credit Hours: **3 Cr. Hrs.**
- **Lectures:** **3 Hrs.**
- **Tutorial/Lab:** **2 Hrs.**
- **Total:** **5 Hrs.**

Prerequisite: EPR 441: Electric Machines

B- Professional Information

1- Catalogue Course Description:

Single phase induction motors, Two phase machines and applications in control systems, Special AC machines. Power diodes, Power bipolar junction transistors, Thyristors, Rectifiers, Principles of power conditioning, Switching characteristics of power semiconductor devices, Computer simulation of power electronic circuits, Analysis, design, and applications of power converters.

2- Overall aims of the course:

The Main Goals of this course are:
- Understand the fundamentals of electric motors
- Understand the physics of different power electronic switches.
- Understand the principle of operation of power electronic converters.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Identify the main characteristics of different power electronic devices.

a2. Explain the source of power loss in power electronic devices
a3. Recognize the operation of power electronic converters
a4. Identify the operation of electric motors under different operating conditions

b- Intellectual skills:

By the end of this course the student should be able to:

b1. Apply circuits related theories and knowledge of electronic components in power electronic converters
b2. Classify the different types of power electronic switches and their applications
b3. Analyze the performance of rectifier circuits under different loading conditions.

c- Professional and practical skills:

By the end of this course the student should be able to:

c1. Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.
c2. Apply safe systems at work and observe the appropriate steps to manage risks
c3. Perform experiments related to power electronic converters under different loading conditions.
c4. Prepare and present technical reports.

d- General and transferable skills:

By the end of this course the student should be able to:

d1. Collaborate effectively within multidisciplinary team.
d2. Work in stressful environment and within constraints.
d3. Communicate effectively.
d4. Effectively manage tasks, time, and resources.

The course ILOs are mapped to the program ILOs in Table (1) in the Appendix.

4- Course Contents:

#	Topics	Lec. (Hrs.)	Tutorial/Lab (Hrs.)	Total (Hrs.)
1	Introduction	3	2	5
2	Power Electronic Switches	9	6	15
3	Power loss and thermal analysis	6	4	10
4	Power electronic converters	15	10	25
5	AC motors	12	8	20
Total		**45**	**30**	**75**

The course contents are mapped to the course ILOs in Table (2) in the Appendix.

5- Lab/Computer/ project Work:

Activity	Facility	Title
Experiment#1	Power Electronics Lab	Operation of Rectifiers and Inverters
Experiment#2	Power Electronics Lab	Speed Control of Three Phase Induction Motors

6- Learning/Teaching Methods:

6.1- Interactive lectures

6.2- Experiential learning
6.2- Self reading
6.3- Report writing

The learning/teaching methods are mapped to the course ILOs in Table (3) in the Appendix.

7- Assessment

- Final exam:..........40%
- Semester work:
  - Mid-Term exams..........30%
  - In Class Quizzes..........10%
  - Lab..........10%
  - Assignments..........5%
  - Participation..........5%

The assessment methods are mapped to the course ILOs in Table (4) in the Appendix.

8- List of references:

1. M. H. Rashid. Power Electronics: Circuits, Devices, and Applications, 4th ed. Pearson Education Inc., 2013 (Text Book).
2. B.M. Bird, K.G. King, D.A. Pedder, "An Introduction to Power Electronics, 2nd edition", John Wiley and Sons Ltd, 1993.
3. Ned Mohan, "Power Electronics: A First Course", John Wiley and Sons Ltd, 2011.

9. Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Electrical engineering library
- Power electronics laboratory

Course coordinator: **Dr. Walid Omran**
Head of Department: **Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs									
		A06	B01	B05	C4	C7	C10	D1	D2	D3	D6
		Elements, theories, techniques of analysis of DC/AC circuits, electrical machines, and energy systems	Think in a creative and innovative way in problem solving and design	Apply different theories and techniques to analyze problems of DC/AC circuits, energy systems and DC/AC machines	Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.	Apply safe systems at work and observe the appropriate steps to manage risks	Prepare and present technical reports	Collaborate effectively within multidisciplinary team.	Work in stressful environment and within constraints	Communicate effectively	Effectively manage tasks, time, and resources
Course ILOs	a1	■									
	a2	■									
	a3	■									
	a4	■									
	b1		■								
	b2		■								
	b3			■							
	c1				■						
	c2					■					
	c3						■				
	c4										
	d1							■			
	d2								■		
	d3									■	
	d4										■

Table (2): Course Contents/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding				Intellectual Skills			Practical Skills				General Skills			
Topic	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Introduction	■														
Power Electronic Switches	■					■						■			
Power loss and thermal analysis		■	■		■										
Power electronic converters				■	■		■	■	■	■	■	■	■	■	■
AC motors				■	■		■	■	■	■	■	■	■	■	■

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding				Intellectual Skills			Practical Skills				General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Interactive lectures	■	■	■	■	■	■	■								
Experiential learning				■			■	■	■	■		■	■	■	■
Self reading	■						■								
Report writing											■				

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs														
	Knowledge & Understanding				Intellectual Skills			Practical Skills				General Skills			
Learning/Teaching Method	a1	a2	a3	a4	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■								
Assignments	■						■				■				
Laboratory								■	■	■	■	■	■	■	■
Relative weight %	30%				55%			10%				5%			

Basic Engineering Sciences (MAN, MPR, SCM)

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

MAN 381: Managerial and Engineering Economy

Programme(s) on which the course is given:	Electronic and Communication Engineering and Electrical Power Engineering
Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Electrical Engineering
Academic level/ semester:	Level 2 – 4th semester
Date of specification approval:	Nov., 2017

A. Basic Information

Title: Managerial and Engineering Economy **Code: MAN 381**
Credit Hours: 2 Cr. Hrs.
Lectures: 2 Hrs.
Tutorial: 1 Hrs.
Total: 3 Hrs.

B. Professional Information

1. **Catalogue Course Description:**
Introductory finance: time value of money, cash flow analysis, and Investment evaluation methods: present worth, annual worth and internal rate of return, Depreciation models and asset replacement analysis, the impact of inflation, taxation, uncertainty and risk on investment decisions.

2. **Overall aims of the course:**
Upon successful completion of the course, the student should be able to:

- Understand the present worth, future worth and the annual worth for a given plant.
- Draw the cash flow diagram
- Apply methods of economic selection.
- Share ideas and work in a team or a group.

3. **Intended Learning Outcomes of Course (ILOs):**

a. Knowledge and understanding:

By the end of this course the student should be able to:

a1. Summarize the components and concepts of engineering economics.
a2. List solving techniques of engineering economic.
a3. Describe theorems for solving the problems of optimal economical cost function of projects.

b. Intellectual skills:

By the end of this course the student should be able to:

b1. Express ideas in structural and mathematic terms so that quantities evaluation is facilitated.
b2. Apply different alternative solutions.
b3. Decide among different solution alternatives of depreciation models.
b4. Evaluate obtained results of present worth and capitalized cost calculations both individually or as a part of team.

d. General and transferable skills:

By the end of this course the student should be able to:

d1. Write appropriate general economic reports in accordance with standard scientific guidelines.
d2. Work in a self-directed manner.
d3. Work coherently and successfully as a part of a team.
d4. Analyses general economic problems with innovative thinking of solutions.

4. Course Contents:

Topic	No. of Hours	Lecture	Tutorial/practical
The general economic problem.	3 hrs.	2 hr.	1 hr.
Fixed charge, capital costs, annual operating costs and methods of economic selections	8 hrs.	6 hrs.	2 hrs.
Nominal and effective interest rates (cost of money)	9 hrs.	6 hrs.	3 hrs.
Present worth comparison of equal- life alternatives.	9 hrs.	6 hrs.	3 hrs.
Present worth comparison of different- life alternatives.	4 hrs.	2 hrs.	2 hrs.
Capitalized –cost calculations.	9 hrs.	6 hrs.	3hrs.
Annual cost comparison of both equal- life and different- life alternatives.	3 hrs.	2 hrs.	1 hr.
TOTAL	**45 hrs.**	**30 hrs.**	**15 hrs.**

5. Teaching and learning methods:

5.1 Lectures
5.2 Tutorials
5.3 Presentations of reports

6. Student Assessment Methods:

6.1 Mid Term Exams to assess the skills of problem solving, understanding of related topics.
6.2 Home reports, interactive discussions, and presentations
6.3 Final Written exam to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied.

7. Assessment schedule

Assessment 1	**First Mid-Term Exam**	**Week 7**
Assessment 2	**Second Mid-Term Exam**	**Week 11**
Assessment 3	**Quizzes and Assignments**	**Weekly**
Assessment 4	**Final Exam**	**Week 15**

Weighting of assessments

Attendance	**10 %**
Quizzes and Reports	**10%**
Mid-term I exam	**20 %**
Mid-term II exam	**20 %**
Final-term examination	**40 %**
Total	**100 %**

8. List of references:

8.1 Course notes
No course notes are required
8.2 Essential books (text books)
William G. Sullivan, Elin M. Wicks C. Patrick, and Koelling, "Engineering economy", Fifteenth Edition, 2013.
8.3 Recommended books
R. Panneerselvam ," Engineering Economics", Thirteenth Printing Published by Asoke K. Ghosh, PHI Learning Private Limited, M-97, Connaught Circus, New Delhi-110001 and Printed by Meenakshi Art Printers, Delhi-11000, January, 2012

9. Facilities required for teaching and learning:
9.1 Lecture Hall
9.2 White board
9.3 Data show for presentations

Course coordinator:	**Assoc. Prof. Dr. Said Fouad Mekhamer**
Head of Department:	**Prof. Dr. Kamel Mohamed Hassan**
Date:	Nov., 2017

Appendix
Table (1): Program ILOs matrix

		Program ILOs Elec. & Communication				
		A2	B1	B2	D1	D3
		Topics related to humanities and general knowledge including business, management, Professional ethics, legislations, environmental engineering, technical language and report writing	Think in a creative and innovative way in problem solving and design.	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems	Collaborate effectively within multidisciplinary team.	Communicate effectively.
Course ILOs	a1.					
	a2.					
	a3.					
	b1.					
	b2.					
	b3.					
	b4.					
	d1.					
	d2.					
	d3.					
	d4.					

		Program ILOs Electric Power				
		A5	B1	B3	D1	D3
		Principles of Business, management, economics and legislations relevant to electrical engineering	Apply mathematics and physics knowledge to solve engineering problems.	Think in a creative and innovative way in problem solving and design.	Collaborate effectively within multidisciplinary team.	Communicate effectively.
Course ILOs	a1.					
	a2.					
	a3.					
	b1.					
	b2.					
	b3.					
	b4.					
	d1.					
	d2.					
	d3.					
	d4.					

Table (2): Course Contents/Course ILOs Matrix

Topic	Knowledge & Understanding			Intellectual Skills				General Skills			
	a1	a2	a3	b1	b2	b3	b4	d1	d2	d3	d4
The general economic problem.	■										
Fixed charge, capital costs, annual operating costs and methods of economic selections	■			■							
Nominal and effective interest rates (cost of money)	■			■							■
Present worth comparison of equal-life alternatives.	■	■							■		
Present worth comparison of different- life alternatives.	■			■							■
Capitalized –cost calculations.	■										
Annual cost comparison of both equal- life and different- life alternatives.	■	■			■				■		■

Table (3): Learning-Teaching Method/Course ILOs Matrix

Learning/Teaching Method	Knowledge & Understanding			Intellectual Skills				General Skills			
	a1	a2	a3	b1	b2	b3	b4	d1	d2	d3	d4
Lecture	■	■	■	■	■	■					
Small Groups Discussion						■	■	■	■	■	■
Search for Data (Self-study)						■	■	■	■	■	■
Research Presentation						■	■	■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

Assessment Method	Knowledge & Understanding			Intellectual Skills				General Skills			
	a1	a2	a3	b1	b2	b3	b4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■				
Discussion and Participation				■	■	■		■	■	■	■
Relative weight %	30%			40%				30%			

جـــــامــــعة المســــــتقبل

Future University in Egypt - FUE

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

MPR 243: Thermodynamics and Fluid Mechanics

Programme(s) on which the course is given: B.Sc. in Electronic & Communication Engineering and B.Sc. in Electrical Power Engineering

Major or minor element of programmes:	(Not Applicable)
Department offering the programme:	Electrical Engineering
Department offering the course:	Mechanical Engineering
Academic level/ semester:	Level 2 – 3rd semester
Date of specification approval:	November 2017

A- Basic Information

Title:	**Thermodynamics and Fluid Mechanics**
Code:	**MPR 243**
Credit Hours:	**3 Cr. Hrs**
Lectures:	**3 Hrs**
Tutorial/Lab:	**2 Hrs**
Total:	**5 Hrs**
Prerequisite:	**PHY 131 Physics 1**

B- Professional Information

1- Catalogue Course Description:

Thermodynamics: macroscopic approach to energy analysis, energy transfer as work and heat, and the first law of thermodynamics, Properties and states of simple substances, Control-mass and control-volume analysis, The essence of entropy and the second law of thermodynamics, Fluid dynamic: fluid properties, similarity of fluid flows, conservation equations, conservation of mass-momentum, Newton second law, energy conservation of mechanical energy (Bernoulli Equation), Application: flow through pipes: laminar and turbulent flow, Pipes connected in series or in parallel, branching of pipes, Measuring devices, Mathematical models.

2- Overall aims of the course:

The overall aims of this course are:

- Enrich students' knowledge about the theory of fluid mechanics and the comparison between fluids and other substances.
- Enrich students' knowledge about the theory of thermodynamics and heat transfer systems on different thermodynamics systems.
- Train students' to measure different fluid properties and analyze different fluid systems in laboratory.

3- Intended learning outcomes of course (ILOs):

a- <u>Knowledge and understanding:</u>

By the end of this course the student should be able to:

a1 Relate the physics background to fluids.
a2 Recognize the difference between fluids and other substances.
a3 Define new terms; System, Thermodynamics, Fluid Mechanics.
a4 State the difference between different fluid flow types.
a5 Illustrate between series and parallel pipe network design.

b- <u>Intellectual skills:</u>

By the end of this course the student should be able to:

b1 Think in a creative way to solve different engineering problems related to Thermodynamics and Fluid Mechanics.
b2 Analyze different system types found in nature.
b3 Deduce conservation equations of mass and energy.

c- <u>Professional and practical skills:</u>

By the end of this course the student should be able to:

c1 Calculate experimentally the performance of fluid and thermal devices.
c2 Practice basic experiments on Thermodynamics and Fluid Mechanics.
c3 Follow up safety requirements at experimental work and observe the appropriate steps to manage risks.
c4 Write a technical report on a project or an assignment.

d- <u>General and transferable skills:</u>

By the end of this course the student should be able to:

d1 Collaborate effectively within multidisciplinary team.
d2 Lead and motivate individuals.
d3 Effectively manage tasks, time, and resources.
d4 Refer to relevant literatures.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

	Topics	Lec. (CrHrs)	Tut. (CrHrs)	Total (CrHrs)
1	Introduction to fluid mechanics	3	3	6
2	Properties of fluids	6	3	9
3	Fluid statics	3	3	6
4	Fluid kinematics	3	3	6
5	Fluid dynamics	9	3	12
6	Internal flow	3	3	6
7	Introduction to thermodynamics	3	3	6
8	Heat transfer methods	6	3	9
9	First law of thermodynamics	6	3	9
10	Second law of thermodynamics	3	3	6
Total (CrHrs)		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment

- Semester work:
  - In class quizzes and attendance 10%
  - Assignments 10%
  - Midterm exams 30%
  - Participation (Lab reports, Research activity and Oral Exam) 10%
- Final exam: 40%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

8- List of references:

1. Text Book: Yunus A. Çengel, John M. Cimbala and Robert H. Turner, Thermal-Fluid Sciences, 2010.
2. Students Lecture Notes
3. Handouts

9- Facilities required for teaching and learning:

- White board.
- Data show for presentations.
- Internet facility: YouTube website.

Course Coordinator: **Dr. Mohamed A. Karali**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November - 2017**

Appendix

Table [1-A]: Course ILOs/ Program ILOs (Electronics & Communication) Matrix

			Course ILOs															
			a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Program ILOs (Electronics & Communication)	A01	Basic sciences including classical and solid state physics, mechanics and chemistry.																
	A04	Topics from other engineering disciplines including engineering graphics, civil engineering, production technology, thermodynamics and fluid mechanics.																
	B01	Think in a creative and innovative way in problem solving and design.																
	C04	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analysis and interpret results.																
	C07	Follow up safety requirements at work and observe the appropriate steps to manage risks.																
	C10	Edit and present technical report.																
	D01	Collaborate effectively within multidisciplinary team.																
	D05	Lead and motivate individuals.																
	D06	Effectively manage tasks, time, and resources.																
	D09	Refer to relevant literatures.																

Table [1-B]: Course ILOs/ Program ILOs (Electric Power) Matrix

			Course ILOs															
			a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Program ILOs (Electric Power)	A02	Basic sciences including classical and solid state physics, mechanics and chemistry.	■	■		■												
	A10	Topics from other engineering disciplines including engineering graphics, civil engineering, production technology, thermodynamics and fluid mechanics.	■	■	■	■	■											
	B03	Think in a creative and innovative way in problem solving and design.						■	■	■								
	C03	Use computational facilities and related software tools, measuring instruments, workshops and relevant laboratory equipment to design and diagnosis experiments, collect data, analysis and interpret results.									■	■						
	C06	Follow up safety requirements at work and observe the appropriate steps to manage risks.											■					
	C08	Prepare and present technical report.												■				
	D01	Collaborate effectively within multidisciplinary team.													■			
	D05	Lead and motivate individuals.														■		
	D06	Effectively manage tasks, time, and resources.															■	
	D09	Refer to relevant literatures.																■

Table [2]: Course contents / ILOs

Topic	Course ILOs															
	Knowledge and Understanding					Intellectual Skills			Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Introduction to fluid mechanics	■	■	■	■		■	■		■							
Properties of fluids	■	■	■	■		■	■		■							
Fluid statics			■			■			■	■	■	■	■	■	■	■
Fluid dynamics			■	■	■	■		■	■	■	■	■	■	■	■	■
Pipe networks design					■	■										
Introduction to thermodynamics			■			■	■		■							
First law of thermodynamics			■			■		■	■	■	■	■	■	■	■	■
Second law of thermodynamics			■			■		■	■				■	■	■	■

Table (3): Learning-Teaching Method / Course ILOs Matrix

Topic	Course ILOs															
	Knowledge and Understanding					Intellectual Skills			Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Interactive Lecturing	■	■	■	■	■	■	■	■								
Discussion	■	■	■	■	■	■	■	■								
Problem Solving						■	■	■								
Experiential Learning									■	■	■	■			■	
Cooperative Learning													■	■		
Research activity																■

Table (4): Assessment Method / Course ILOs Matrix

Topic	Course ILOs															
	Knowledge and Understanding					Intellectual Skills			Practical Skills				General Skills			
	a1	a2	a3	a4	a5	b1	b2	b3	c1	c2	c3	c4	d1	d2	d3	d4
Written Exams	■	■	■	■	■	■	■	■								
Lab Reports, Research activity and Oral Exam									■	■	■	■	■	■	■	■
Relative weight %	40%					40%			10%				10%			

جـــــامـــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

SCM 217: Civil Engineering

Programme(s) on which the course is given: B.Sc. in Electronic and Communication Engineering and Electrical Power Engineering
Major or minor element of programs: (Not Applicable)
Department offering the program: Electrical Engineering
Department offering the course: Electrical Engineering
Academic level/ semester: Level Two – 4th semester
Date of specification approval: November 2017

A- Basic Information

Title: Civil Engineering **Code: SCM 217**
Credit Hours: 2 Cr. Hrs.
Lectures: 2 Hrs.
Tutorial: 1 Hrs.
Total: 3 Hrs.

B- Professional Information

1- Catalogue Course Description:

Types and usage of buildings: concrete, metallic, Construction materials and Specifications, Types of walls and ceilings, Foundations, Calculation of reactions for beams, frames and trusses, Drawing N.F.D., S.F.D. and B.M.D. for simple structures. First principles of geodetic surveying, Surveying equipment, Leveling methods, Longitudinal and transverse contour sections.

2- Overall aims of the course:

Upon successful completion of the course, the student should be able to:

1. Know how to model simple structures.
2. Learn the physical/mechanical properties of construction materials.
3. Know how to draw internal force diagrams for simple structures.
4. Apply basics of survey to measure angles, distances and heights.
5. Share ideas and work in a team or a group.

3- Intended Learning Outcomes of Course (ILOs):

a- Knowledge and understanding:

a1- Demonstrate knowledge and understanding of modeling simple structures.
a2- Demonstrate knowledge and understanding of physical/mechanical properties of construction materials.
a3- Demonstrate knowledge and understanding of principles of geodetic surveying, surveying equipment.

b- Intellectual skills:

b1- Draw internal force diagrams for simple structures.
b2- Apply basics of survey to measure angles, distances and heights.
b3- Decide and chose among different solution alternatives.
b4- Evaluate obtained results both individually or as a part of team.

4- Contents:

Topic	No. of Hours	Lecture	Tutorial/practical
Types of structures, loads and supports.	1 week (3 hrs./week) = 3 hrs.	2 hr.	1 hr.
Calculation of reactions for beams, frames and trusses.	4 week (3 hrs./week) = 12 hrs.	8 hr.	4 hr.
Calculation of internal forces at any section.	1 week (3 hrs./week) = 3 hrs.	2 hr.	1 hr.
Drawing N.F.D., S.F.D. and B.M.D. for simple structures.	3 weeks (3 hrs./week) = 9 hrs.	6 hr.	3 hr.
Mechanical properties for some construction materials.	2 weeks (3 hrs./week) = 6 hrs.	4 hr.	2 hr.
Classes of Survey.	1 week (3 hrs./week) = 3 hrs.	2 hr.	1 hr.
Ordinary leveling – Grid leveling.	2 week (3 hrs./week) = 3 hrs.	4 hr.	2 hr.
Open and closed traverse.	1 week (3 hrs./week) = 3 hrs.	2 hr.	1 hr.
TOTAL	**45 hrs.**	**30 hrs.**	**15 hrs.**

5- Teaching and learning methods:

4.1- Lectures
4.2- Tutorials
4.3- Laboratories

6- Student Assessment Methods:

Assessment schedule

Assessment 1 First Mid-Term Exam Week 7

Assessment 2	Second Mid-Term Exam	Week 11
Assessment 3	Quizzes and Assignments	Weekly
Assessment 4	Final Exam	Week 15

Weighting of assessments

Assignments	15 %
Reports	15%
Mid-term exams	30 %
Final-term examination	40 %
Total	**100 %**

7- List of references:

6.1- Course notes

No course notes are required

6.2- Essential books (text books)

1) M. El-Dakhakhni. *Theory of Structures*. Cairo: Dar El-Maaref.
2) Mc Cormac, Jack. *Surveying*. 3rd edition: John Wiley and Sons, 1995.
3) Somayaji, Shan. *Civil Engineering Materials*. 2 edition: Prentice Hall, 2001.

6.3- Recommended books

1) Vien et al. *Surveying for Engineers*. Third Edition, 1994.
2) M. Mamlouk and J. Zaniewski, Micheal and John. *Materials for Civil Engineering and Construction Engineers*. 2 edition: Prentice Hall, 2005.

8- Facilities required for teaching and learning:

7.1- Lecture Hall
7.2- White board
7.3- Data show for presentations

Course coordinator: **Dr. Moneer M. Abu-Elnaga**

Head of Department: **Prof. Dr. Kamel Mohamed Hassan**

Date: November 2017

Appendix

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs Elec. & Comm.		
		A4	A5	B2
		Topics from other engineering disciplines including engineering graphics, building construction, surveying, thermodynamics, fluid mechanics.	Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.
Course ILOs	a1.			
	a2.			
	a3.			
	b1.			
	b2.			
	b3.			
	b4.			

Table (1): Course ILOs/ Program ILOs Matrix

		Program ILOs Electric Power		
		A1	A10	B1
		numerical analysis, complex & special functions, statistics and their applications on signal analysis.	Topics from other engineering disciplines including engineering graphics, building construction, surveying, thermodynamics, fluid mechanics.	Apply mathematics and physics knowledge to solve engineering problems.
Course ILOs	a4.			
	a5.			
	a6.			
	b1.			
	b2.			
	b3.			
	b4.			

Table (2): Course Contents/Course ILOs Matrix

	Course ILOs						
	Knowledge & Understanding			Intellectual Skills			
Topic	a1	a2	a3	b1	b2	b3	b4
Types of structures, loads and supports.	■						
Calculation of reactions for beams, frames and trusses.	■			■	■	■	■
Calculation of internal forces at any section.	■			■	■	■	■
Drawing N.F.D., S.F.D. and B.M.D. for simple structures.	■						
Mechanical properties for some construction materials.		■					
Classes of Survey.			■				
Ordinary leveling – Grid leveling.			■				
Open and closed traverse.			■				

Table (3): Learning-Teaching Method/Course ILOs Matrix

	Course ILOs						
	Knowledge & Understanding			Intellectual Skills			
Learning/Teaching Method	a1	a2	a3	b1	b2	b3	b4
Interactive Lecturing	■	■	■	■	■	■	■
Discussion				■	■	■	■
Problem solving				■	■	■	■

Table (4): Assessment Method/Course ILOs Matrix

	Course ILOs						
	Knowledge & Understanding			Intellectual Skills			
Assessment Method	a1	a2	a3	b1	b2	b3	b4
Written Exams	■	■	■	■	■	■	■
Discussion and Participation				■	■	■	■
Lab work and Report				■	■	■	■
Relative weight %	40%			60%			

Mathematics and Basic Sciences (MTH, PHY)

جـــــامـــعة المســـــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications

MTH 211: Functions of several variables and Ordinary Differential equations

Program (s) on which the course is given:	B.Sc. in Electronics & Communication and Electric Power Engineering
Major or minor element of Programs:	(Not Applicable)
Department offering the Program:	Electrical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	Level Two-3rd Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Functions of several variables and Ordinary Differential equations
Code: MTH 211

Credit Hours:	**3 Cr. Hrs.**
Lectures:	**3 Hrs./week**
Tutorial:	**2 Hrs.**
Total:	**5 Hrs.**

Prerequisite: MTH 112: Integration with applications and analytic geometry (Credit Hours 3)

B- Professional Information

1- Catalog Course Description:

Functions of several variables: Limits, Continuity, partial derivatives, Extrema and Constrained Extrema. Multiple integrals in Cartesian and Polar coordinates. Jacobians, Vector analysis: Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Line integral, Green's theorem, Gauss's theorems, and Stoke theorem. Ordinary differential equations of the first and higher orders. Complementary and Particular solutions. Undetermined coefficients, and variation of parameters. Euler's equations and system of linear differential equations. Differential Operator method.

2- Overall aims of the course:

Overall aims of the course are:

- Enrich students' knowledge about several variables, multiple integrals, ordinary differential equations, and vector Analysis.
- Develop students' skills to apply differential equations on applications related to electrical engineering.

3- Intended learning outcomes of course (ILOs):

a- <u>Knowledge and understanding:</u>

By the end of this course the student should be able to:

a1. Define the behavior of the function of several variables, multiple integrals Vector analysis, and Ordinary differential equations.

a2. Recognize the Limits, Continuity, and partial derivatives, extrema and constrained extrema of functions of 2 variables, double and triple integral in Cartesian and Polar coordinates.

a3. Illustrate the surface integral of scalar and vector fields, Divergence and Stock theorems, Jacobians, line integrals, cylindrical and spherica coordinates and its application,

a4. Describe Ordinary differential equations, distinguish between the degree and the order, and know various methods of the solution,

a5. Identify the general and particular solutions of O.D.E of the first order second order, higher order.

b- <u>Intellectual skills:</u>

By the end of this course the student should **be able to:**

b1. Apply theories, techniques of Vector analysis, Ordinary differential equations to solve electrical engineering problems

b2. Think creatively in solving problems related to electrical engineering.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Weeks	Topics	Lect.	Tut.	Total
1,2	Functions of several variables: Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema.	6	4	10
3,4	Multiple integrals: Double integrals in Cartesian and Polar coordinates, Jacobians, Cylindrical and spherical coordinates.	6	4	10
5,6	Vector analysis: Scalar and vector fields, Surface integrals of scalar and vector functions, gradient, divergence, curl, directional derivative, Line integrals.	6	4	10
7,8	Line integrals, Green's theorem, Gauss's theorem, Stoker's theorem and triple integrals in Cartesian and Polar coordinates.	6	4	10
9,10	Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti.	6	4	10
11,12	Higher order linear equations. Equations of the second order. Equations reducible to the first order. Complementary, and particular solutions.	6	4	10
13,14	Methods of Undetermined coefficients, and variation of parameters. Euler's equation	6	4	10
15	System of linear differential equations. Differential Operator method.	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- Assessment Methods

See Appendix, table [4]

8-Weighing of Assessments

- Final exam:...40%
- Semester work:……………………………………………… ….50%
  - First Mid Term Exam...............................20%
  - Second Mid Term Exam ….……….…. 20%
  - Quiz Exam …………………………… 5%
  - Assignments …………………………..5%
  - Participation and perfromance..10%

- Total……………………………………………………..100%

9-List of references:

1. **Text Book:**

   Warren S.Wright, Dennis G.Zill : " **Advanced Engineering Mathematics"**, Fifth Edition, Jones &Bartlett Learning

2. **Recommended Readings:**
   - Earl W. Swokowski, "Calculus with Analytic Geometry
     Peter V. O'Neil, "Advanced Engineering Mathematics"
   - Larson, R, Edwards, B & Falvo, D 2004, Elementary linear algebra, 5th edn, Houghton Mufflin, Boston, Massachusetts.
   - Stewart, J 2005, Calculus: concepts & contexts, 3rd edn, Thomson/Brooks/Cole, Australia.

10-Facilities required for teaching and learning:

- Library services
- Recently published books
- Student Advice and Information Center
- Computer workstations
- Internet web connection

Course coordinator: **Prof. Dr. Emil Sobhy Shoukralla**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		A02	B02
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic
Course ILOs	a1	■	
	a2	■	
	a3	■	
	a4	■	
	a5	■	
	b1		■
	b2		■

Table [2]: Course Content/ILO Matrix

Topics	a1	a2	a3	a4	a5	b1	b2
Functions of several variables: Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema.							
Multiple integrals: Double and triple integrals in Cartesian and Polar coordinates, Jacobians, Cylindrical and spherical coordinates.							
Vector analysis: Scalar and vector fields, Surface integrals of scalar and vector functions, gradient, divergence, curl, directional derivative, Line integrals, Green's theorem, Gauss's theorems, Stokes's theorems.							
Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti.							
Higher order linear equations. Equations of the second order. Complementary and particular solutions. Undetermined coefficients, variation of parameters. Euler's equation, Equations reducible to the first order.							
System of linear differential equations. Differential Operator method.							

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2
Interactive Lecturing								
Discussion								
Problem solving								

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	a6	b1	b2
Final Exam								
First Midterm Exam								
Second Midterm Exam								
Quizzes								
Assignment								
Participation and Performance								
Weight	70 %						30 %	

جــــامــــعة المســــتقبل

FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications
MTH 212: Transformations and Numerical Analysis

Program(s) on which the course is given:	B.Sc. in Electronics & Communication and Electric Power Engineering
Major or minor element of Program:	(Not Applicable)
Department offering the Program:	Electrical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	2nd Level - 4th Semester
Date of specification approval:	November 2017

A. Basic Information

Title: Transformations and Numerical Analysis (Math4) Code: MTH 212
Credit Hours: 3 Cr. Hrs.
Lecture: 3 Hrs.
Tutorial: 2 Hrs.
Total: 5 Hrs.
Prerequisite: MTH 211: Functions of several variables and Ordinary Differential equations (Credit Hours 3).

B. Professional Information

1. Catalog Course Description:

Laplace Transforms. Definitions. Properties and theorems. Inverse Laplace transforms. Calculating of Laplace transforms, Periodic functions, unit-step functions, and Dirac delta functions. Calculating of Inverse Laplace Transforms. Solution of Initial value problems and integral equations by Laplace transforms. Fourier series. Periodic and non-periodic Functions. Series of odd and even functions. Convergence Theorem.. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms and Applications. Numerical solution of nonlinear equations, Newton's method. Secant method. Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Least Squares methods. Interpolation.

.

2 - Overall aims of the course:

- Demonstrate a conscious understanding of the concepts of integral transforms, Laplace and Fourier transforms.
- Develop students' mathematical skills for the methods of solution of initial and boundary values problems by using Laplace and Fourier Transforms, Fourier series, and Fourier integrals.
- Acquire skills for the application of Numerical methods to the solution of electrical engineering problems.

3 - Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should maintain proficiency level at:

a1- Recognize the fundamental concepts of Laplace transforms, Inverse Laplace Transforms, and Laplace transform for derivatives.

a2- Define Shifted Laplace transform, unit – step functions, unit impulses, Dirac delta-function, Fourier series, Fourier integrals, and Fourier Transforms.

a3- Explain Laplace transforms, Fourier series, Fourier integrals, and Fourier transforms, with convergence for the solution of initial values problems.

a4- State the difference between approximate solutions, interpolate solution, numerical solutions, and exact solutions.

a5- Outlines, Euler methods, and Rung -Kutta methods for the numerical solutions of Initial value problems, and Least squares method, and interpolation by Lagrange polynomials for tabulated and explicit functions.

b- Intellectual skills:

By the end of this course the student should maintain proficiency level at:

b1- Recognizing methods of calculating Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.

b2- Use Laplace Transforms, Inverse Laplace Transforms, Fourier series, Fourier Integrals, and Fourier Transforms for the solution of initial values problems.

b3- Use Fourier series, Fourier integrals, an Fourier Transform to Approximate functions.

b4- Apply Laplace and Inverse Laplace transform, Fourier Transforms, and Rung -Kutta, Euler, and modified Euler, for the solution of initial value problems.

b5- Approximate and interpolate functions by using Least squares methods, and interpolation by Lagrange polynomials at the intellectual level required of this course.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Weeks	Topics	Lect.	Tut.	Total
1,2	Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.	6	4	10
3,4	Calculating of Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.	6	4	10
5,6	Calculating of Inverse Laplace Transforms. Solution of Initial value problems	6	4	10
7, 8	Integral equations by Laplace transform, Fourier series. Periodic and non-periodic Functions.	6	4	10
9,10	Series of odd and even functions. Half intervals Fourrier Series Convergence Theorem.	6	4	10
11,12	Fourier Integrals and Fourier Transforms. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms. Applications.	6	4	10
13,14	Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Applications.	6	4	10
15	Least Squares methods. Interpolation.	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOS Teaching & Assessment Method:

See Appendix, table [4]

8- Weighting of Assessment

- Final exam: ………………………………………….40%
- Year work: …………………………………………. 50%
  - First Midterm Exam………20%
  - Second Midterm Exam…… 20%
  - Quiz Exam ……………..….5%
  - Assignments ………………5%
  - Preformance …………………………..…….10%
- Total…………………………………………………100%

9- List of references:

1. Text Book:

Dennis G. Zill Warren S. Wright, "Advanced Engineering Mathematics" Fifth Edition, JONES &BARTLETT LEARNING.1994.

2. Recommended Readings:

Erwin Kreyszig. "Advanced Engineering Mathematics", 10 editions, John Wiley& Sons, INC, 2010.
Earl W. Swokowski, "Calculus with Analytic geometry, Prindle, Weber & Schmidt
Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson.

- Course notes, Handouts.

- Periodicals, Web sites:
    - www.wolframalpha.com
    - www.sosmath.com, www.math.hmc.edu,
    - www.tutorial.math.lamar.edu,
    - www.web.mit.edu

Facilities required for teaching and learning:

- Main university Library
- Lectures using whiteboard.
- Problems discussion sessions.

Course coordinator: **Prof. Dr. Emil Sobhy Shoukralla**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		A02	B02
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems
Course ILOs	a1		
	a2		
	a3		
	a4		
	a5		
	b1		
	b2		
	b3		
	b4		
	b5		

Table [2]: Course Content/ILO Matrix

Topics	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.										
Calculating of Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.										
Calculating of Inverse Laplace Transforms. Solution of Initial value problems and integral equations by Laplace transforms.										
Fourier series. Periodic and non-periodic Functions. Series of odd and even functions. Half intervals Fortier Series Convergence Theorem.										
Fourier Integrals and Fourier Transforms. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms. Applications.										
Numerical solution of nonlinear equations, Newton's method. Secant method.										
Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods.										
Least Squares methods. Interpolation.										

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
interactive Lecturing										
Discussion										
Problem solving										

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Assignments										
First Midterm Exam										
Second Midterm Exam										
Final Exam										

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Department of Electrical Engineering

Course Specifications
MTH 311: Complex variables and Special functions

Programme (s) on which the course is given	B.Sc. in Electronics & Communication and Electric Power Engineering
Major or minor element of Programmes:	(Not Applicable)
Department offering the Programme	Electrical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/Semester:	Level 3 - 5th Semester
Date of specification approval:	November 2017

A- Basic Information

Title: Complex variables and Special functions **Code:** **MTH 311**

Credit Hours: **3 Cr. Hrs.**

Lectures: **3 Hrs.**

Tutorial: **2 Hrs.**

Total: **5 Hrs.**

Prerequisite: MTH 212: Transformations and Numerical Analysis (Credit Hours: 3 Cr. Hrs.)

B- Professional Information

1- Catalog Course Description:

Power Series solutions of ordinary Differential equations. Solutions about Ordinary Points, Solutions about Singular Points. Frobineous theorem. Special functions, Partial differential equations, heat and wave equations. Laplace equation in Rectangular and Polar coordinates, D'lambert solution, Numerical solutions of Partial differential equations. Functions of complex variables, Cauchy-Riemann Equations, Complex integrals, Laurent series, Evaluation of real integrals by residues. Conformal mappings.

2- Overall aims of the course:

The overall aims of the course are

- Demonstrate a conscious understanding of the concepts of special functions and complex analysis.
- Develop students' mathematical skills for the methods of solution of partial differential equations.
- Acquire skills for the application of special functions and complex analysis to solve electrical engineering problems

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1. Explain the Power Series solutions of ordinary Differential Solutions using Frobineus theorem.
a2. Identifying Partial differential equations, their types and methods of solutions.
a3. Define Gamma, Beta, and Bessel functions, and Legendre Polynomials as solutions of partial differential equations.
a4. Demonstrate Elementary complex functions, Cauchy-Riemann Equations, Complex integrals, Laurent series, and the evaluation of real integrals by residues.
a5. Describe conformal mappings for electrical engineering applications.

b- Intellectual skills:

By the end of this course the student should be able to:

b1. Apply Special functions, power series solutions to solve electrical engineering problems.
b2. Apply numerical solutions of P.D.E to solve problems related to heat, wave, and Laplace equations.
b3. Solving improper integrals converted to Gamma and Beta functions.
b4. Applying Cauchy-Riemann Equations, Laurent series, and residues theorem for the solution of complex engineering problems.
b5. Creating conformal mapping procedures for the solution of complex functions problems.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

week	Topics	Lect.	Tut.	Total
1	Power Series solutions of ordinary Differential equations.	3	2	5
2	Frobineous Theorem	3	2	5
3	Special functions , Gamma , Beta , Bessel functions	3	2	5
4	Legendre Polynomial	3	2	5
5	Partial differential equations, Definitions and Classification of equations,	3	2	5
6	Separable Partial differential equations, heat equation, Wave equation	3	2	5
7	D'lambert solution of wave equation	3	2	5
8	Laplace equation in Rectangular and Polar coordinates	3	2	5

9 & 10	Numerical solutions of Partial differential equations, Finite difference method	6	4	10
11	Functions of complex variables, Elementary complex functions	3	2	5
12	Cauchy-Riemann Equations	3	2	5
13	Complex integrals, Laurent series	3	2	5
14	Evaluation of real integrals by residues	3	2	5
15	Conformal mappings	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOs Teaching & Assessment Method:

See Appendix, table [4]

8-Weighting of Assessments

- Final exam:..40%
- year work:……………………………………………………….50%
  - First Mid Term Exam....................20%
  - Second Mid Term Exam 20%
  - Quiz Exam ……………… ……5%
  - Assignments …………………….5%
  - Participation.. 10%

- Total……………………………………………………………100%

9-List of references:

1. **Text Book:**
   - Dennis G. Zill Warren S. Wright, "Advanced Engineering Mathematics” Fifth Edition, JONES &BARTLETT LEARNING.1994.

2. **Recommended Readings:**
   - Erwin Kreyszig. "Advanced Engineering Mathematics", 10th edition, John Wiley& Sons, INC, 2010.
   - Robert T. Smith, Roland B Minton. Calculus: Early Transcendental Functions. 4th. edition. McGraw – HILL International Edition, 2012.

10-Facilities required for teaching and learning:

- **Library services**
- **Recently published books**
- **Student Advice and Information Center**
- **Computer workstations**
- **Internet web connection**
- **Smart Board**

Course coordinator:	**Prof. Dr. Emil Sobhy Shoukralla**
Head of Department:	**Prof. Dr. Kamel Hassan**
Date:	**November 2017**

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		A02	**B02**
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.
Course ILOs	a1		
	a2		
	a3		
	a4		
	a5		
	b1		
	b2		
	b3		
	b4		
	b5		

Table [2]: Course Content/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
Power Series solutions of ordinary Differential equations.	■									
Frobineous Theorem	■									
Special functions , Gamma , Beta , Bessel functions			■			■		■		
Legendre Polynomial			■			■		■		
Partial differential equations, Definitions and Classification of equations,		■								
Separable Partial differential equations, heat equation, Wave equation		■	■				■	■		
D'lambert solution of wave equation		■					■			
Laplace equation in Rectangular and Polar coordinates		■								
Numerical solutions of Partial differential equations, Finite difference method		■					■			
Functions of complex variables, Elementary complex functions				■					■	
Cauchy-Riemann Equations				■					■	
Complex integrals, Laurent series				■					■	
Evaluation of real integrals by residues				■					■	
Conformal mappings					■					■

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
interactive Lecturing	■	■	■	■	■	■	■	■	■	■
Discussion	■		■	■	■	■	■	■	■	■
Problem solving						■	■	■	■	■

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5
First Midterm Exam				■	■				■	■
Second Midterm Exam		■	■			■		■		
Final Exam	■	■	■	■		■	■	■	■	

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FUE - Future University in Egypt

Faculty of Engineering and Technology

Department of Electrical Engineering

Course Specifications

MTH 312: Probability and Statistics

Program (s) on which the course is given	Electronics & Communication and Electric Power Engineering
Major or minor element of Program:	(Not Applicable)
Department offering the Program	Electrical Engineering
Department offering the course:	Engineering Mathematics and Physics
Academic year/semester:	Level 3 – 6th semester
Date of specification approval:	November 2017

A- Basic Information

Title: Probability and Statistics **Code: MTH 312**

Credit Hours: **3Cr. Hrs.**

Lectures: **3Hrs.**

Tutorial: **2 Hrs.**

Total: **5 Hrs./week**

Prerequisite:

MTH 311 :Complex variable and special functions (MATH 5) (credit hours 3)

B- Professional Information

1- Catalog Course Description:

Descriptive statistics and data analysis, Introduction to probability theory, conditional probability, Bayes theorem, Random variables and probability distribution, Discrete and continuous random variables, Mathematical expectation of random variables and some special expectation, Some discrete probability distribution (Binomial and poisson). Some continuous distribution (Normal distribution, t- distribution), Introduction to estimation and tests of hypothesis. Correlation analysis, applied statistics.

2- Overall aims of the course:

This course aims to develop the students' confidence and skills in dealing with mathematical expressions of statistical Science, to improve their understanding of the concepts of statistical studies and to perform descriptive and basic inferential statistical studies. The course gives the students the ability to understand the inference techniques for the inferential statistical studies within the areas of interest.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

- a1. Recognize the fundamental features of the probability theory, and other statistical topics.
- a2. Distinguish the meaning of conditional probability and its application.
- a3. Describe random variables, discrete and continuous distributions.
- a4. Define samples and population measures (point and interval estimate).

b- Intellectual skills:

By the end of this course the student should be able to:

- b1. Summarize Statistical concepts essential and necessary for applications in electric engineering problems.
- b2. Think logically and creatively.
- b3. Analyze the appropriate method for the solutions of statistical engineering proble using convenient methods.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

Week	Topics	Lect.	Tut.	Total
1,2	Descriptive statistics and data analysis. Definitions and concepts.	6	4	10
3,4	Probability Introduction to probability theory, conditional probability, Bayes theorem	6	4	10
5,6	Random variables and probability distribution: Discrete and continuous random variables	6	4	10
7,8	Mathematical expectation of random variables and some special expectation.	6	4	10
9,10	Some discrete probability distribution (Binomial and Poisson).	6	4	10
11,12	Some continuous distribution (Normal distribution).	6	4	10
13,14	Introduction to the estimation and tests of hypothesis.	6	4	10
15	Correlation analysis.	3	2	5
	Total	45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- learning/teaching methods:

See Appendix, table [3]

7- ILOS Teaching & Assessment Methods:

See Appendix, table [4]

8- Weighting of assessments

- Final exam:………………………………40%
- Year work:……………………………...50%
    - First Exam………………..20%
    - Second Exam……………..20%
    - Assignments………………5%
    - Quizzes……………………5%
    - Participation………………………10%

- Total………………………………………100%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4]

9- List of references:

1-Text book:

- Allan G. Bluman, ‘Elementary Statistics’: A Step-by-Step Approach, 9th ed. McGraw-Hill. 2014.

2-Recommended Readings:

- Ronald E. Walpole, Raymond H. Myers, and Sharon L. Myers. “Probability & Statistics for Engineers & Scientists’, 9th ed., Pearson Education, Inc. 2012.
- Douglas C. Montgomery, George C. Ringer. “Applied Statistics and Probability for Engineers”, 6th Edition. John Wiley & Sons, Inc. 2013.
- Periodicals, Web sites:
    - www.stattrek.com
    - www.statistics.com
    - www.sosmath.com
    - www.math.hmc.edu
    - www.tutorial.math.lamar.edu
    - www.web.mit.edu

10- Facilities required for teaching and learning:

- White board
- Data show
- Central University Library

Course coordinator: **Prof. Dr. Emil Shoukralla**
Head of Department: **Prof. Dr. Kamel Hassan**
Date: **November 2017**

Appendix

Table [1]: Course ILOs/ Program ILOs Matrix

		A02	B02
		Mathematics including differential and integral calculus, algebra and analytical geometry, differential equations, Fourier analysis, vector analysis, numerical analysis, complex & special functions, statistics and their applications on electrical engineering	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems
Course ILOs	a1		
	a2		
	a3		
	a4		
	b1		
	b2		
	b3		

Table [2]: Course Content/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
Descriptive statistics and data analysis. Definitions and concepts.							
Probability Introduction to probability theory, conditional probability, Bayes theorem							
Random variables and probability distribution: Discrete and continuous random variables							
Mathematical expectation of random variables and some special expectation.							
Some discrete probability distribution (Binomial and Poisson).							
Some continuous distribution (Normal distribution).							
Introduction to the estimation and tests of hypothesis.							
Correlation analysis.							

Table [3]: Learning Method/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
interactive Lecturing							
Discussion							
Problem solving							

Table [4]: Assessment Method/ILO Matrix

Topic	a1	a2	a3	a4	b1	b2	b3
First Midterm Exam							
Second Midterm Exam							
Final Exam							

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FUE - Future University in Egypt

Faculty of Engineering and Technology
Electrical Engineering Department

Course Specifications

PHY 232: Solid State Physics

Programme (s) on which the course is given: B.Sc. in Electronics & Communication and Electric Power Engineering
Major or minor element of programmes: (Not Applicable)
Department offering the programme: Electrical Engineering Department
Department offering the course: Mathematics and Engineering Physics Department
Level / Semester: Level 2 / 3rd semester
Date of specification approval: November 2017

A- Basic Information

Title: Solid State Physics **Code: PHY 232**
Credit Hours: 3 Cr. Hrs.
Lectures: 3 Hrs.
Laboratory / Tutorial: 2 Hrs.
Total: 4 Hrs.
Prerequisite: Physics II (PHY 132)

B- Professional Information

1- Catalog Course Description:

Classification of waves. Max-Planck's principle, photoelectric effect, the wave properties of particles, the quantum particle, uncertainty Heisenberg's principle. Interpretation of quantum mechanics, Schrödinger equation, electron as a wave, particle in an infinite/finite potential well, tunneling effect. Hydrogen atom: Bohr's model, quantum model and wave function, solids classification and crystalline structure. Energy bands, Fermi-Dirac distribution, Carrier densities and transport, recombination and generation, drift-diffusion model, Intrinsic and extrinsic semiconductors, PN junction: structure and principle of operation, diode current, reverse bias, diode as a circuit element.

2- Overall aims of the course:

Overall aims of the course are:

- Enrich students' knowledge about classical, modern and quantum physics
- Enrich students' knowledge about atomic structure and crystal systems.

- Develop students' background knowledge about Intrinsic and extrinsic semiconductors.
- Train students to apply solid state physics and semiconductor on application related to electrical engineering.

3- Intended learning outcomes of course (ILOs):

a- Knowledge and understanding:

By the end of this course the student should be able to:

a1- Define the types of waves.

a2- Explain the comparative view between classical and modern physics.

a3- Illustrate modern physics as a single topic.

a4- Describe and define quantum mechanics.

a5- Describe the atomic physics and atomic structure.

a6- Explain and execute the theory of semiconductors.

b- Intellectual skills:

By the end of this course the student should be able to:

b1- Review different physical quantities.

b2- Evaluate the physical quantities that are not directly measurable.

b3- Predict the action/outcome of different bodies and systems.

b4- Analyze the governing laws of modern, quantum and solid state physics.

c- Professional and practical skills:

By the end of this course the student should be able to:

c1- Measure the different physical parameters and perform experiments related to the solid state physics.

c2- Adapting knowledge to solve engineering problems using scientific tools.

c3- Simulate the behavior of PN-junction using software tool.

d- General and transferable skills:

By the end of this course the student should be able to :

d1- Work effectively in a team.

d2- Communicate effectively.

4- Course ILOs versus Program ILOs relation

See Appendix, table [1]

5- Course Contents:

#	Topics	Lecture	Lab. / Tut.	Total
1	Classification of waves	3	0	3
2	Max-Planck's principle, photoelectric effect	3	4	7
3	the wave properties of particles, the quantum particle, uncertainty Heisenberg's principle	3	2	5
4	Interpretation of quantum mechanics, Schrödinger equation, electron as a wave	3	2	5
5	particle in an infinite/finite potential well, tunneling effect	3	2	5
6	Hydrogen atom: Bohr's model, quantum model and wave function	3	2	5
7	Solids classification and crystalline structure	3	4	7
8	Energy bands, Fermi-Dirac distribution,	3	2	5
9	Carrier densities and transport, recombination and generation	6	4	10
10	drift-diffusion model, Intrinsic and extrinsic semiconductors	6	2	8
11	PN junction: structure and principle of operation, diode current, reverse bias, diode as a circuit element.	9	6	15
Total		45	30	75

For the relation between the course contents and "Intended Learning Outcomes" (ILOs) see Appendix, table [2]

6- Lab./Computer/project work:

Activity	Facility	Title
Experiment#1	Solid state Physics Lab.	Photoelectric Effect
Experiment#2	Solid state Physics Lab.	Specific Charge of Electron.
Experiment#3	Solid state Physics Lab.	PN Junction I/V Characteristics.
Experiment#4	Solid state Physics Lab.	Several Nano-Hub simulations of PN junction.

Course Project: N/A.

7- learning/teaching methods:

See Appendix, table [3]

8- Assessment

- Final exam:..40%
- Semester work:
  - Mid-Term Exam 1..15%
  - Mid-Term Exam 2..15%
  - Participation and performance..10%
  - Tutorial..5%
  - Lab..15%

For the relation between the course "Intended Learning Outcomes" (ILOs) and the used assessment method see Appendix, table [4].

9- List of references:

1. Text Books:

- "**Principles of physics**", Halliday and Resnick, Jearl Walker, 9^{th} Edition, 2012.
- "**Semiconductor Physics and Devices: Basic Principles",** Donald A. Neamen, 4^{th} Edition. McGraw-Hill.

2. Recommended for Readings:

a) **"College physics",** Giambattista and Richardson**,** Mac gramttill, 3^{rd} edition, 2010.

b) **"Physics for scientists and engineers",** Serway, Thomson Brookes/Cok., 8^{th} edition, 2011.

10- Facilities required for teaching and learning:

- Solid state Physics Laboratory.
- Whiteboard in lectures
- Data-Shows in some lectures.
- Videos of Applications (online).
- Direct interaction on the internet.

Course coordinator: **Dr. Mohamed Ehab**

Head of Department: **Prof. Dr. Kamel Hassan**

Date: **November 2017**

Appendix

Table [1]: Course/Program ILO Matrix

		A01	B02	C01	D01	D03
		Basic Sciences including classical and solid state physics, mechanics and chemistry	Apply appropriate mathematical and physics knowledge for modeling and analyzing electronic and communication systems problems.	Apply theories and techniques of mathematics, basic sciences and information technology to electronic and communication system problems	Collaborate effectively within multidisciplinary team	Communicate effectively
Course ILOs	a1					
	a2					
	a3					
	a4					
	a5					
	a6					
	b1					
	b2					
	b3					
	b4					
	c1					
	c2					
	c3					
	d1					
	d2					

Table [2]: Course Content/ILO Matrix

Course Content	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	d1	d2
Classification of waves	■														
Max-Planck's principle, photoelectric effect		■	■				■		■	■	■	■			
the wave properties of particles, the quantum particle, uncertainty Heisenberg's principle		■	■							■					■
Interpretation of quantum mechanics, Schrödinger equation, electron as a wave				■			■	■		■	■				■
particle in an infinite/finite potential well, tunneling effect				■				■		■					■
Hydrogen atom: Bohr's model, quantum model and wave function					■					■					
Solids classification and crystalline structure					■	■				■				■	
Energy bands, Fermi-Dirac distribution,					■	■				■					
Carrier densities and transport, recombination and generation					■	■	■			■	■		■		
drift-diffusion model, Intrinsic and extrinsic semiconductors					■	■	■			■	■	■	■		■
PN junction: structure and principle of operation, diode current, reverse bias, diode as a circuit element.					■	■			■	■	■	■	■	■	■

Table [3]: Learning Method/ILO Matrix

Course Content	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	d1	d2
Interactive Lecturing	■	■	■	■	■	■	■	■	■	■					
Discussion							■	■	■	■					
Problem solving							■	■	■	■					
Experimental learning											■	■	■	■	■
Cooperative learning											■	■	■	■	■

Table [4]: Assessment Method/ILO Matrix

Assessment	a1	a2	a3	a4	a5	a6	b1	b2	b3	b4	c1	c2	c3	d1	d2
Written Exams (Midterm1 – Midterm2)	■	■	■	■					■	■					
Participation and performance	■	■	■	■	■	■	■	■		■				■	
Tutorial								■							■
Laboratory									■		■	■	■	■	
Written Exams Final Exam			■	■	■	■		■	■	■					