Adama Science and Technology University

"We are dedicated to innovative knowledge"

College of Electrical Engineering and Computing

Department of Electronics and Communication Engineering

Curriculum for Undergraduate program

November, 2024

Adama, Ethiopia

Prepared by:

Department of Electronics & Communication Engineering

Endorsement

This curriculum document is endorsed by the ASTU Senate

Date Endorsed

November,2024

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List of Acronyms

ASQAC	Academic Standards and Quality Assurance Committee
ASTU	Adama Science and Technology University
CGPA	Cumulative Grade Points Average
CLO	Course Learning Outcome
CQI	Continual Quality Improvement
Cr.hr	Credit hour
DAC	Department Academic Council
ECTS	European Credit Transfer System
EHEE	Ethiopian Higher Education Entrance Examination
OBE	Outcome Based Education
PEO	Program Educational Objective
PLO	Program learning outcome
SO	Student Outcome
QMS	Quality Management System
SLT	Student Learning Time

1. Introduction

1.1. Background of the program

The department of Electronics and Communication Engineering (ECE) is one of the three departments in College of Electrical Engineering and Computing of Adama Science and Technology University. The current Electronics and Communication Engineering department of Adama Science and Technology University emerged as Electrical/Electronic Technology Department of the former Nazareth Technical College (NTC) when the College was established in 1993. Since then, the department had gone through a series of curricular changes and the department continued until the commencement of the Electrical Engineering degree program and finally to Electrical and Computer Engineering Department. Now with the new direction of ASTU, it is renamed as Electronics and Communication Engineering Department.

Electronics and Communication Engineering is a program that aims to integrate separate engineering fields to meet the joint demands made by the Electronics and Communication industries in today's world. Electronics and communication engineering program curriculum include design, implementation and testing of a wide range of Electronics and Communication systems such as electronic devices, communications devices, digital signal processing and networking.

Graduates of this program are ideally placed to pursue their specialization in any of the two streams, either Electronics Engineering or Communication Engineering based on their zeal, interest and skill. Our graduates can work at the forefront of all the major areas of Electronics as well as Communication Engineering.

In Electronics Engineering, students will develop knowledge and skills to use semiconductor devices to create a wide variety of products and services which includes design and development of Microelectronic devices, PCB & IC fabrication and Embedded Systems as well.

In Communication Engineering, they will develop the knowledge and skill to design and use electronic, photonic and electromagnetic devices to exchange information among locations on earth and in space. A communication Engineer is responsible for designing, building and overseeing the installation of communication equipment and facilities, such as complex electronic switching systems, telephone, and fiber optics.

The courses within our degree program include both hardware and partial software technologies and an understanding of their application, ranging from the smallest embedded micro-processor to global communication systems. At ASTU, we adopt a teaching style that is research-led, so the latest cutting-edge technologies will be taught as part of the course. Our courses combine theory with practical and project work – an approach which can help the student to turn ideas into real systems.

Focused on strategic direction of ASTU for Ethiopian development, the department is working aggressively to produce qualified, competent, and socially responsible professionals in the fields of Electronics and Communication Engineering through promoting research-oriented Electronics and Communication Engineering. To achieve this, the curriculum of ECE undergraduate program is revised to meet the requirements of accreditation which relays on principles of outcome-based education (OBE) and also emphasis on continuous quality improvements (CQI). Enhancing the quality of our programs via curriculum accreditation helps to assure the structure and content of a program to meet internationally recognized standards. This will in turn allows international movement of educated workforce to all over the world. To this end, it is necessaryto revise the existing curriculum by applying accreditation process on the basis of ABET Accord for engineering programs.

1.2. Rationale of the Program

Engineering in general and Electronics & Communication in particular is a highly dynamic field of study in that the rapid development of the technology doesn't allow leaving academic curricula untouched for a long time. Thus, to minimize the gap between the state-of-the-art and the teaching process and maintain the relevance and educational standard, there is always a need for curricula review. The basic rationale of the programs is in the prevailing conditions in the Country with respect to the needs for professionals in this area and the future trends that are developing in the demands for the profession.

Ethiopia, like many of the developing countries, is essentially a user of products of Electronics and communication Engineering technology. So far, the undergraduate program is designed so as to meet the needs of the main employers of the graduates in the operation and maintenance of Electronics and Communication equipment. To meet these needs the program is made broad enough to cover most major areas of Electronics and

Communication. But it has now become necessary to look ahead to the future needs of the country and provide educational means to meet these needs.

It is still logical to maintain the broad nature of the undergraduate curricula that affords the graduates versatility in terms of employment. But it has now become necessary to look ahead to the future needs of the Country and provide educational means to meet these needs. The current revision of the curricula has therefore sought to address these through strengthening all the graduates.

1.3. Vision and Mission of the university

1.3.1. Vision

- ASTU aspires to be the first choice in Ethiopia and the premier center of excellence in applied science and technology in Africa by 2025.

1.3.2. Mission

M1: Produce ethical and internationally competent graduates in applied science and Technology through quality education.

M2: Conduct problem solving research.

M3: Provide demand driven community service.

M4: Serve as center for innovative knowledge and technology transfer for various industries.

1.4. Program Education Objectives (PEOs)

The Department of Electronics and Communication Engineering has developed and maintained a well-defined set of educational objectives and desired Student Outcomes. Educational objectives of the program cater to the requirements of the stakeholders such as students, parents, employers, alumni, faculty etc.

The program educational objectives shall describe accomplishments that a five years program graduates are expected to perform and attain/achieve in the first few years after graduation (e.g.in 3-5 years). The program educational objectives are as follows:

Table 1: Program Education Objectives (PEO)

PEO	Statement
PEO-1	To provide graduates with a strong foundation in mathematics, science and engineering fundamentals to enable them to devise and deliver efficient solutions to challenging problems in Electronics & Communications Engineering.
PEO-2	To produce ethically competent and technically qualified Electronics and Communication Engineers with the potential to become leaders in Industries and Companies associated with Electronics and Communication Engineering, and able to pursue research or have successful career in Academia.
PEO-3	To produce Electronics and Communication Engineers who are committed to sustainable development of Electronics and Communication Systems Companiesand Industries for the betterment of society and nation.
PEO-4	To prepare graduates that can critically analyze existing literature in an area of specialization and ethically develop innovative and research-oriented methodologies to solve the problems identified to support the socio-economic development of the nation.

1.5. Mapping of PEO with University Mission

The mapping Program Education Objectives to the university mission shall indicate the responsiveness of the program designed to the expressed interest of program stakeholders.

Table 2: Mapping of PEO with University Mission

M / PEO	M1	M2	M3	M4
PEO-1	√			
PEO-2				√
PEO-3			√	
PEO-4		√		

1.6. Student Outcomes (SO)

The Electronics and Communication Engineering program is measured through its attainment of the Student Outcomes (SO)/Program Level Outcomes (PLO) of the program and its courses. The Student Outcomes describe what a student should know, understand, and perform/ be able to do at the completion of their degree program.

Table 3: Student Outcome for Engineering

SO	**Statement**
SO1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
SO2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
SO3	An ability to communicate effectively with a range of audiences.
SO4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
SO5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
SO6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
SO7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

1.7. Mapping of SO with PEO

The SO should be mapped with the PEO so that it clearly indicate/reflect the responsiveness of the Student Outcome to the Program Education Objectives settled based on the expressed interest of program stakeholders. During mapping, every SO shall be mapped to PEO.

Table 4: Mapping of SO with PEO

PEO / SO	PEO-1	PEO-2	PEO-3	PEO-4
SO-1	√			
SO-2			√	

SO-3		√		
SO-4		√		
SO-5		√		
SO-6				√
SO-7				√

1.8. Degree Nomenclature

After successful completion of all the requirements a student graduating from the Electronicsand Communication Engineering program will be awarded:

Bachelor of Science Degree in Electronics and Communication Engineering

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1.9. Duration of study

1.9.1. Regular Program

The duration of the study of Undergraduate Electronics & Communication Engineering program is five years, ten semesters i.e. two semesters per academic year and two summer internship semesters. However, Fast track students may finish before ten semesters and delayed students may finish after ten semesters. For dual major/minor there may be one-year extension as stated in the university senate legislation August 2017, Article 98.1

1.9.2. Continuing education Program

The duration for study of the continuing undergraduate education programs shall be from five toeight years depending on the programs as stated in the university senate legislation August 2017,Article 98.2.

2. Program Requirements

2.1. Admission Requirements

2.1.1. Admission requirements for regular program

The minimum admission requirements for the undergraduate regular program are as stated in the Senate legislation August 2017, Article 72. Hence, admission to the undergraduate programs of ASTU shall be based on the completion of the preparatory and obtaining the necessary pass marks in the Ethiopian Higher Education Entrance Examination (EHEE) or equivalent academic achievements from foreign countries as well as the passing entrance examination set by the Ministry and/ or ASTU.

Upon on completion of the University Requirement courses students will join each school/program based on the Admission and Placement criteria supervised by Students Committee of the Senate according to the student interest of the program and the criteria set forsuch purposes as stated in the university senate legislation August 2017, Article 81.

2.1.2. Admission requirements for continuing education program

The admission requirements for the undergraduate continuing education program shall be in accordance with the developed criteria by institute of the continuing and distance education as stated in the senate legislation August 2017, Article 74.

2.2. Graduation Requirements

Graduation requirement for all undergraduate programs shall be stated /defined in a way to satisfy the course and credit requirements as stated in the university's senate legislation August 2017, Article 125 for engineering programs. Overall cumulative grade point average (CGPA), and CGPA for the core Electronics and Communication Engineering courses must each be at least **2.0** with no "F, I, NG" grades for successful completion. The students in this program must satisfy:

(a) The University regulations (university requirement) including the process of Academic Performance Evaluation

(b) The College regulations (College requirements) apply to all B.Sc. Programs in the school. Students should consult their College when planning their program and selecting courses.

(c) Program requirements (core courses in the program)

(d) Electives (Restricted and Free)

- ✓ The student must select & take one of the courses listed under each RestrictedElective
- ✓ The student must take any available course from the university for free Electives.

2.3. Total Credit Requirement

General Mandatory	Basic Mandatory	Major mandatory	Major Elective	Free Elective	Total
29	**49**	73	**36**	3	190

3. Course Plan

3.1. Course Code and numbering

All courses offered by the University shall be numbered as per the system of numbering courses provided by ASQAC as stated in the senate legislation August 2017, Article 87.

Hence, each course will have a prefix; each prefix contains four letters (ECEg = **E**lectronics and **C**ommunication **E**ngineerin**g**) without any space will be followed by four digits.In the numeric codes:

- The first digit indicates the year (level) in which the course is given,
- The second digit indicates the category to which the course belongs,
  - Category 0 = General,
  - Category 1 = Basic
  - Category 2 = major mandatory Courses
  - Category 3= major Elective Courses,
- The last two digits indicate the semester in which the course is given.

- All courses given in the first semester represent by the last odd number (01, 03,05, 07, 09, 11…etc.)
- All courses given in the second semester represent by the last even number (02,04, 06, 08, 12…etc.)

3.2. Course design and category

3.2.1. Course design

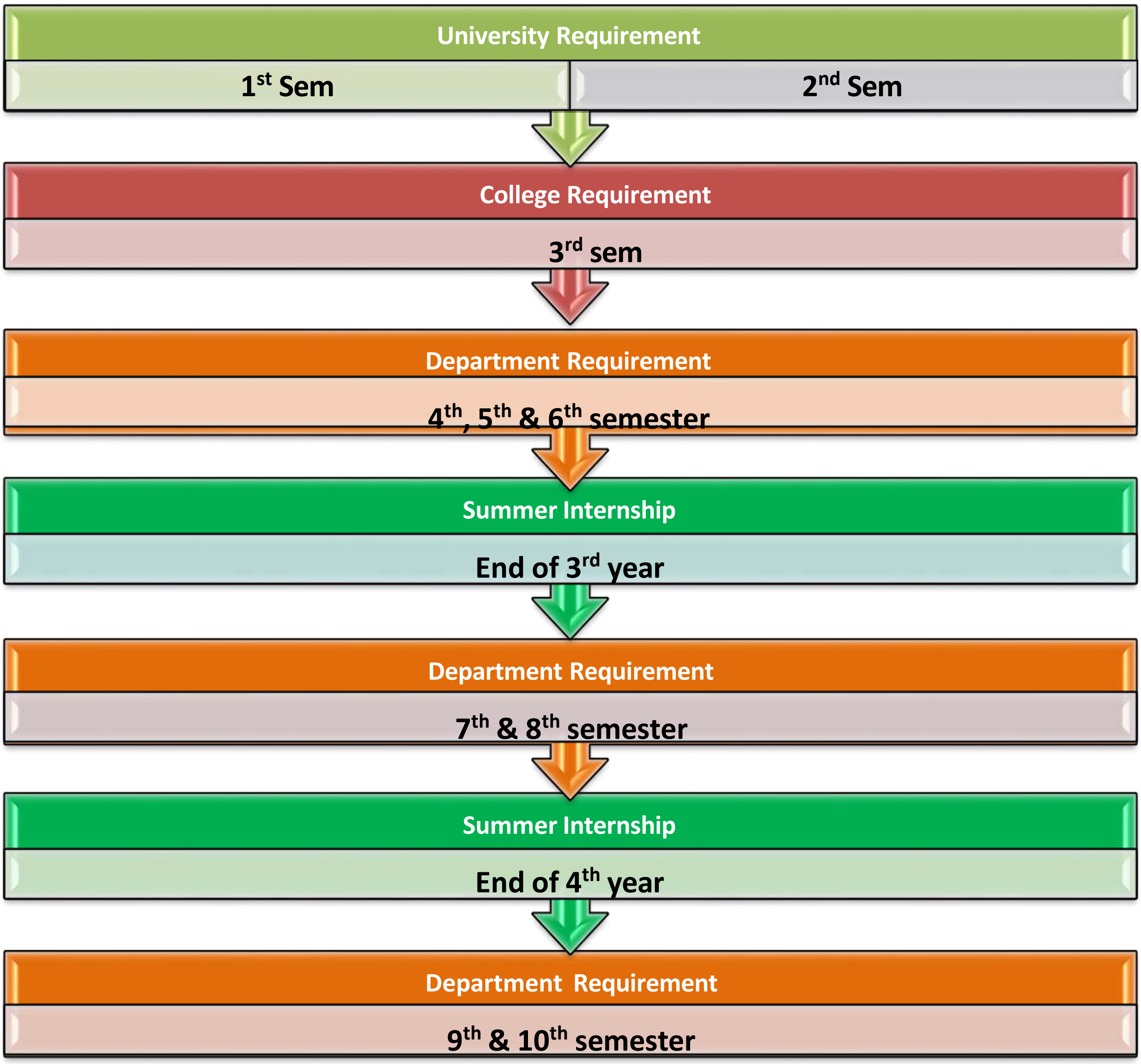

Figure 1: Course design

3.2.2. Course Categories

The structure of the course shall be categorized as Major, Basic, General and Free courses which in turn can be divided into Compulsory/mandatory and Elective depending on the level of importance of the delivery of the course at different Colleges and programs in the University, again it can be categorized as University, College, department or Individual (free) required.

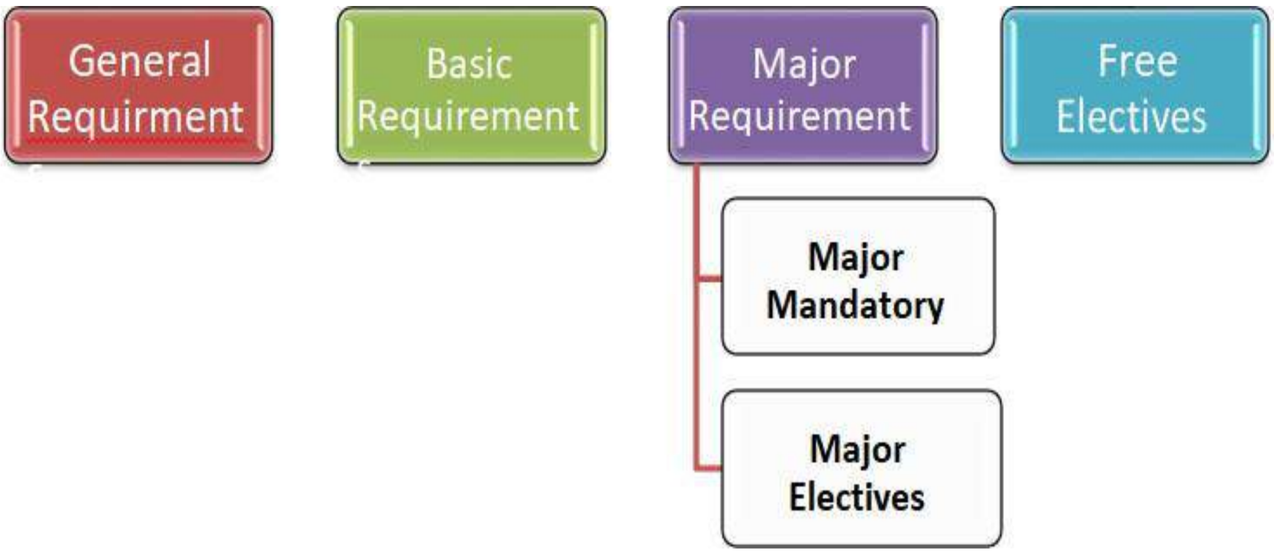

Figure 2: Course categories

I. General Requirements

General requirements are Humanities, Arts, Social Science and Business courses. All students must take at least **29** credits of general requirement courses.

II. Basic Requirements

Includes applied science courses that need to be completed for all majors and a few courses that apply to certain majors only. All students must take at least **49** credits of Basic requirement courses.

III. Major Mandatory

All students must meet major requirements in order to complete a major program. The total number of required credits is **73**.

IV. Major Electives

Major electives refer to all courses under a major excluding the major mandatory. Students can take courses that are related to their area of concentration or what they plan to study in graduate schools. Students should consult with their College when planning their program and selecting courses. The total credit hour for major elective is **36.**

V. Free Electives

A student can take any courses from any undergraduate programs of the University. However, consultation with the expected advisors is highly recommended. The total number of minimum required credits is **3**

Table 5: The category of the designed courses in the curriculum for a student who joined Electronics & Communication Engineering

<table>
<tr><th>S/NO.</th><th colspan="2">Course category</th><th>Course level</th><th>Credit requirement</th><th>Percentage from the total</th></tr>
<tr><td>1</td><td colspan="3">General Requirements</td><td>29</td><td>15.26%</td></tr>
<tr><td>2</td><td colspan="3">Basic Mandatory Courses</td><td>49</td><td>25.789%</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Major</td><td>Mandatory</td><td rowspan="2">Department requirement</td><td>73</td><td>38.421%</td></tr>
<tr><td>Elective</td><td>36</td><td>18.947%</td></tr>
<tr><td colspan="2">Subtotal</td><td>109</td><td>57.368%</td></tr>
<tr><td>4</td><td colspan="3">Free electives</td><td>3</td><td>1.579%</td></tr>
<tr><td colspan="4">Total</td><td>190</td><td>100%</td></tr>
</table>

4. Teaching - Learning methods and Assessment

4.1. Teaching -Learning / Instructional methods

Teaching and learning methods refers to the broad approaches to the learning and teaching activities. This may include a brief description of the range of teaching and learning methods employed and other innovative features of the program related to teaching and advising students. The teaching and learning methods may include student centered learning such as problem based learning, small group teaching, mini projects, group work, lectures, tutorial sessions, supervised study, student presentations, seminars, work-based learning, practical and development oriented design projects, readings and discussion, role-play, case study, laboratory based learning, computer based learning, invited speakers, independent studies, internship, field work, project work, practical, Industrial visits, interactive "blended: E-learning", lectures by industry professionals, classes and demonstrations or a combination of these and others. Evidences of the extent to which the teaching and learning approaches are student centered and aligned with the Student Outcomes should be indicated.

4.2. Assessment and Evaluation Mechanisms

Assessment and evaluation mechanisms refer to the range and variety of assessment methods oral examination, written examination, oral presentation, test, paper/essay, portfolio, report about an internship, report on fieldwork, continuous assessment, group or individual projects, summative assessment such as final exams, project, problem solving assignments, senior essays, interactive computer and simulation assignments and group presentations …etc. should be clearly indicated.

4.3. Grading System

Examinations are graded on letter grading system as stated in the university senate legislation August 2017, Article111. However, the grading system for industrial attachment/internship/, physical education and Final year project I shall be described as P/F in accordance with their respective curriculum. The status description is based on the raw mark interval given in Table 6.

Table 6: Grading System

Raw Mark interval (100%)	Correspondin gLetter Grade	Corresponding fixed number Grade
[90,100]	A+	4.0
[85,90)	A	4.0
[80,85)	A-	3.75
[75,80)	B+	3.5
[70,75)	B	3.0
[65,70)	B-	2.75
[60,65)	C+	2.5
[50,60)	C	2.0
[45,50)	C-	1.75
[40,45)	D	1.0
[0,40)	F	0

5. Quality Management System (QMS)

Quality management system indicates the reference points used to assess quality and standard of the proposed program. These may include standards and indicators in terms of the breadth and depth of academic content, innovations in teaching and learning, success and track record of graduates in employment, and program accreditation etc. It also includes the program monitoring mechanisms.

The mechanisms may include student, staff and stakeholder feedback schemes; procedures for innovation and improvement of the curriculum, standards and quality of teaching, learning and student performance.

Quality Management Systems Planning and Implementation for OBE shall be established in all academic units in line with the university's commitment to the continuous quality improvement. Therefore, the academic standard and quality assurance (ASQA) directorate shall prepare a different guideline to establish a quality management system in the university. Figure 3 shows different quality management system components.

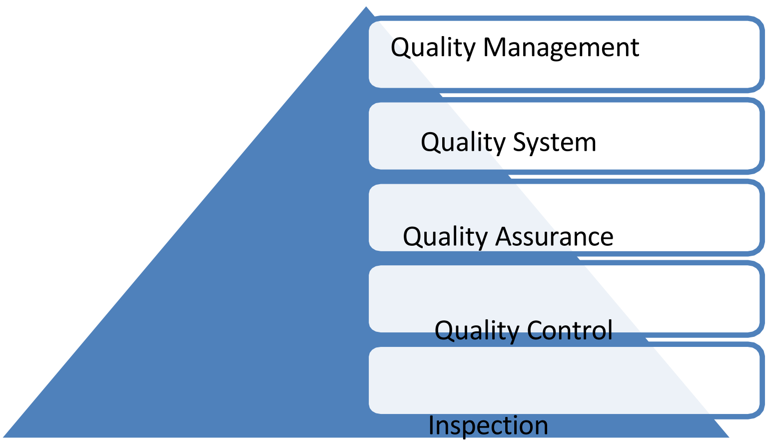

Figure 3: Quality Management System Components

ASTU's commitment to continuous quality improvement is accomplished through a Continuous quality improvement (CQI) cycle in which the University adopts a systematic comparison of institutional performance to institutional purpose to evaluate institutional effectiveness. Figure 4 and 5; illustrate the overall outcome-based education implementation strategies practiced at each department and its quality management process at program level and course level. The diagrams show the processes where the outcomes are being measured at each level and the feedback systems to ensure Continuous quality improvement in our education system. The CQI at unit level (CO) is

Evaluated and assessed every semester, while the PO attainment at the programed level is conducted every year. The PEO assessment, evaluation and revision will be done every five years.

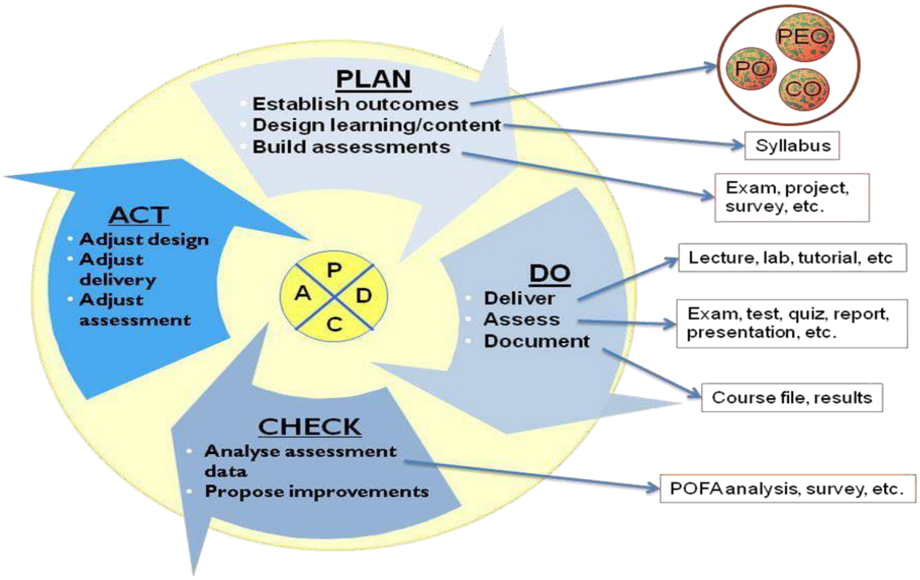

Figure 4: Overall OBE Implementation Strategies

Improvements based on feedback from evaluations will close the system loop and the process will continue year after year. Figure 4 shows that continual quality improvement cycle for outcome-based education.

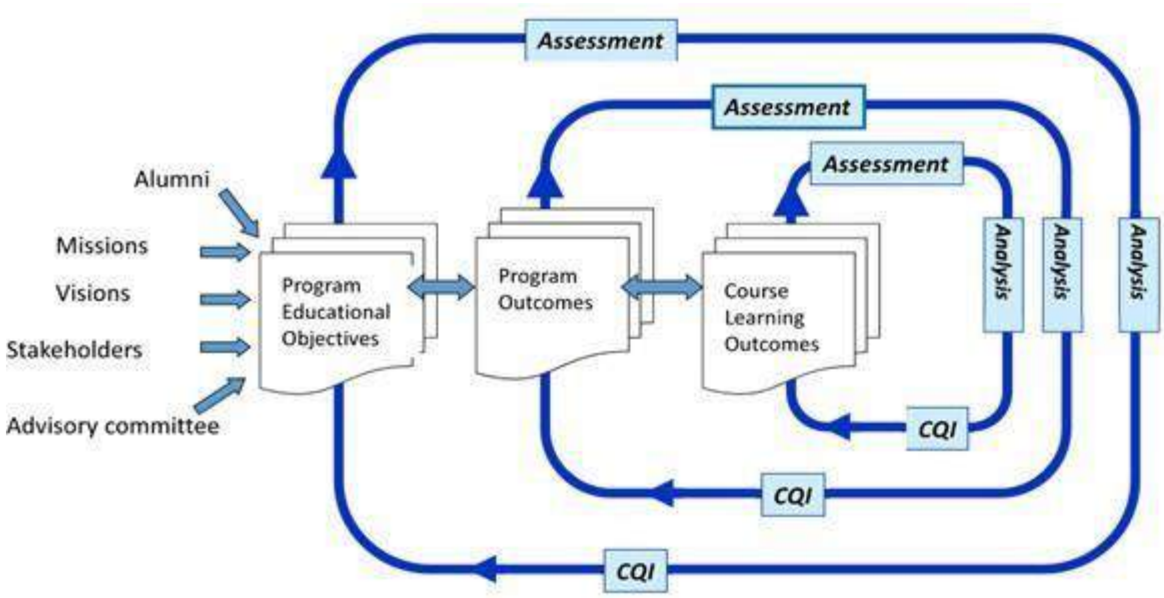

Figure 5: Continual Quality Improvement Cycle

6. Resource

6.1. Human resource/Staff Profile

Table 7: Staff Profile

No.	Staffs (Academics & Admin)	Number of Staff		Subtotal
		Male	Female	
1	Professor	1	0	1
2	Professional Engineers	1	0	1
3	Associate Professor	7	0	7
4	Assistant Professor	4	0	4
5	Senior Lecturer	1	0	1
6	Lecturer	19	4	23
7	Senior Academic and Research Assistant (SARA)	7	0	7
8	Academic and Research Assistant (ARA)	5	3	8
9	Administration staff	1	1	2
Total				**54**

NB. Professor & Professional Engineer is the same person.

6.2. Material Resources and Facility

ECE Department currently owns the following libraries, laboratories, equipment, ICT and access to electronic resources.

Libraries

- Central Library for all ASTU departments with access of books and electronic recourses

Laboratories

- Total Number of Computer Laboratory Rooms are 3.
  - 1 Computer Lab room on B-510
  - 1 Computer Lab room on B-613
  - 1 Computer Lab room on B-606

- Electronics Laboratory
- Communication system laboratory
- Digital Logic Design Laboratory
- VLSI design Laboratory
- Micro processing & Interfacing Laboratory
- Telecommunication & switching Laboratory
- Antenna and Radio Wave Propagation Laboratory
- Micro Wave device and Circuit Laboratory

Offices

- The department has 12 Offices located on buildings B606, B605, B504, and B613 for all faculty members.

7. Guidelines for Double Major and Minor

7.1. General

Students with diverse or multiple areas of interest might consider adding breadth to their academic program by choosing to add a double major. A double major is one of several ways to prepare for the complexity of real-world problems whose solutions are draw on multiple disciplines. Students have CGPA 3.5 or higher may be permitted to have a double major or minor consisting of programs majors from two programs.

7.2. Deadline for declaring a double major

The deadline to declaring a double major is the registration date of a student's first semester of the fourth year. However, it is highly advised that a student declares a double major at the student's first semester of the third year.

7.3. Eligibility requirements

- Be registered as an undergraduate student in ASTU
- Have 3.50 CGPA or higher of the primary major
- Completed a minimum three semesters for engineering and two semesters for applied
- Science students in the primary major department
- Complete pre-requisites courses set by the respective departments, if any
- Advisor recommendations
- Apply on or before the deadline

7.4. Courses and Credit requirements for double major and minor

Students who need double major degree must successfully complete all courses specified by the program while taking all courses required by the first major program.

7.4.1. Courses & Credit requirements for dual major

Student from other program who wants to have **double major degree** in **Electronics and Communication Engineering** must take the following listed courses in addition to College requirement courses which is total of minimum **45** credit hours**.**

Table 8: List courses for dual major

Course Code	Course Title	Cr. Hr. (Lec/ Tut/Lab)	Pre-requisite
ECEg2202	Electronic Circuit II	4(2/3/3)	ECEg2201
EPCE2202	Electromagnetic Field	3(2/3/0)	Math2101
ECEg3205	Digital Signal Processing	3(2/3/0)	ECEg2204
ECEg3103	Probability and Random Processes	3(2/3/0)	Math1102
ECEg2204	Signals and System Analysis	3(2/3/0)	Math2101
ECEg3202	Introduction to Communication Systems	4(2/3/3)	ECEg2202
ECEg3201	Digital Logic Design	4(2/3/3)	ECEg2201
ECEg3306/ ECEg3318	Microelectronic devices & circuits/ Optoelectronics	3(2/0/3)	ECEg2202
ECEg4205	EM Waves and Guide Structure	3(2/0/3)	EPCE2202
ECEg4203	Digital Communication	3(2/0/3)	ECEg3202
ECEg4202	Microprocessors & Interfacing	4(2/3/3)	ECEg4201
ECEg4204	Antenna and Radio Wave Propagation	3(2/0/3)	ECEg4205
ECEg5201	Wireless and Mobile Communication	3(2/0/3)	ECEg4203
ECEg5203	Capstone Project	2(0/0/6)	All major courses
Total CR. HR		45	

7.4.2. Courses & Credit requirements for double minor

Student from other program who wants to have minor degree in Electronics and Communication Engineering must take the following listed courses in addition to College requirement courses which is total of minimum 27 credit hours.

Table 9: List of courses for Dual minor

Course Code	Course Title	Cr. Hr. (Lec/ Tut/Lab)	Pre-requisite
ECEg2202	Electronic Circuit II	4(2/3/3)	ECEg2201
ECEg3205	Digital Signal Processing	3(2/3/0)	ECEg2204
ECEg3202	Introduction to Communication Systems	4(2/3/3)	ECEg2202
ECEg3201	Digital Logic Design	4(2/3/3)	ECEg2201
ECEg3306/ ECEg3318	Microelectronic devices & circuits/ Optoelectronics	3(2/0/3)	ECEg2202
ECEg4203	Digital Communication	3(2/0/3)	ECEg3202
ECEg4204	Antenna and Radio Wave Propagation	3(2/0/3)	ECEg3202
ECEg5201	Wireless and Mobile Communication	3(2/0/3)	ECEg4203
Total CR. HR		27	

7.5. Maximum credit points each semester

The student who has been approved to pursue a double major may exceed the maximum credit points each semester set by the University. However, he /she may petition ahead of time to determine whether this will be approved. Students must be aware that exceeding the maximum credit points without approval is a violation of University regulations, which will render your ineligible for a degree.

7.6. Application process

1. Develop a double major academic plan with your academic advisor and complete application form.
2. Ask your faculty advisor to sign on the application.
3. Ask an administrative and/or advisor from the second program to review your plan and sign the application.

7.7. Duration of the study

In order to receive a diploma for a double major, a student must complete all requirements. If the student completes the requirements for one of the programs, he/she will have to decide between graduating with single major and continuing his/her studies

Until completing both majors. However, the total duration of study may not exceed 12 semesters.

8. Course Requirement

8.1. General University/Department Requirement

Table 10: List of General University/Department Requirement courses

No.	Course Title	Credit-hour	ECTS
01	Entrepreneurship and Business Development	3	5
02	Communicative English	3	5
03	Basic Writing Skills	3	5
04	Introduction to Civics & Citizenship studies	3	5
05	Logic and Critical Thinking	3	5
06	Introduction to Economics	3	5
07	General Psychology and Life Skills	3	5
08	Physical Fitness and Conditioning I	P/F	P/F
09	Physical Fitness and Conditioning II	P/F	P/F
10	Geography of Ethiopia and the Horn	3	5
11	History of Ethiopia and the Horn	3	5
12	Project Management for Engineers	2	3
Total		29	48

8.2. Basic Mandatory Courses

Table 11: List of Basic Mandatory Courses

No.	Course Title	Credit-hour	ECTS
01	Applied Mathematics I	4	7
02	Applied Mathematics II	4	7
03	Applied Mathematics III	4	7
04	Applied Modern Physics	3	5
05	Data Structures & Algorithms	3	5
06	Engineering Drawing	3	5
07	Fundamentals of Electrical Engineering	4	7

08	Fundamentals of Programming	3	5
09	General Chemistry	3	5
10	General Physics	3	5
11	Introduction to Computing	3	5
12	Introduction to Emerging Technologies	3	5
13	Linear Algebra	3	5
14	Computational methods	3	5
15	Solid State Physics	3	5
Total		49	83

8.3. Major Mandatory Courses

Table 12: List of Major Mandatory Courses

No.	Course Title	Credit-hour	ECTS
01	Electronic Circuit I	4	7
02	Electronic Circuit II	4	7
03	Signals and System Analysis	3	5
04	Electromagnetic Field	3	5
05	Engineering Application Software	1	2
06	Probability and Random Processes	3	5
07	Digital Logic Design	4	7
08	Network Analysis & Synthesis	3	5
09	Digital Signal Processing	3	5
10	Introduction to Communication Systems	4	7
11	Computer Architecture and Organization	3	5
12	Digital Communication	3	5
13	EM Waves and Guide Structure	3	5
14	Industry Internship – I	3	5
15	Industry Internship – II	3	5
16	Microprocessor & Interfacing	4	7
17	Antenna and Radio Wave Propagation	3	5
18	Engineering Research and Development Methodology	2	3
19	Data Communication and Computer Networks	3	5

20	Wireless and Mobile Communication	3	5
21	Capstone Project	2	3
22	Integrated Engineering Project	3	
23	Final year project Phase I	2	3
24	Final year project Phase II	4	7
Total		73	118

8.4. Major Elective Courses

Table 13: List of Major Elective Courses

No.	Course Title	Credit-hour	ECTS
01	Microelectronic devices & circuits	3	5
02	Optoelectronics	3	5
03	Object Oriented Programming	3	5
04	Introduction to Artificial Intelligence	3	5
05	Introduction to power system	3	5
06	Introduction to Electrical Machines	3	5
07	Introduction to control System	3	5
08	Electrical Measurement and Instrumentation	3	5
09	Microwave Devices and Systems	3	5
10	Integrated Circuit Technology	3	5
11	VLSI Design	3	5
12	Advanced Computer Networks	3	5
13	Embedded and real time systems	3	5
14	Programmable Logic Controllers and Robotics	3	5
15	Introduction to Mechatronics	3	5
16	Biomedical Instrumentation and Analysis	3	5
17	Power Electronics	3	5
18	Optics and Optical Communication	3	5
19	Satellite Communication	3	5
20	Analysis & design of Digital integrated circuit	3	5
21	Telecommunication Networks and Switching	3	5
22	Introduction to Computer Vision	3	5

23	Semiconductor Devices	3	5
24	Digital Image Processing	3	5
25	Digital Hardware Design	3	5
Total		36	60

8.5. Free Elective

Table 14: List of Free Elective Courses

No.	Course Title	Credit-hour	ECTS
01	Free Elective I	3	5
Total		3	5

9. Semester course breakdown (Scheduling)

Year-I, Semester-I								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	Math1101	Applied Mathematics I	4	7	3	3	0	None
2	Phys1101	General Physics	3	5	2	3	0	None
3	Chem1101	General Chemistry	3	5	2	3	0	None
4	CSEg1101	Introduction to Computing	3	5	2	0	3	None
5	EnLa1001	Communicative English Skill	3	5	2	3	0	None
6	LART1001	Introduction to Civics & Citizenship studies	3	5	3	0	0	None
7	HPEd1011	Physical Fitness and Conditioning I	P/F	-	-	-	-	None
Total			**19**	**32**	**14**	**12**	**3**	

Year-I, Semester-II								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-**
1	Math1102	Applied Mathematics II	4	7	3	3	0	Math1101
2	CSEg1102	Introduction to Emerging Technologies	3	5	2	0	3	None
3	CSEg1104	Fundamentals of Programming	3	5	2	0	3	CSEg1101
4	LART1002	Logic and Critical Thinking	3	5	3	0	0	None
5	Meng1032	Engineering Drawing	3	5	2	0	3	None
6	EnLa1002	Basic Writing Skill	3	5	3	0	0	ENG1011
7	HPEd1022	Physical Fitness and Conditioning II	P/F		-	-	-	HPEd1011
Total			**19**	**32**	**15**	**3**	**9**	

Year-II, Semester-I								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	Math2101	Applied Mathematics III	4	7	3	3	0	Math1102
2	ECEg2201	Electronics Circuit I	4	7	2	3	3	Math1101, Phys1101, and Co-requisite EPCE2101
3	EPCE2101	Fundamentals of Electrical Engineering	4	7	2	3	3	Math1101 , Phys1101
4	CSEg2101	Data Structures & Algorithms	3	5	2	0	3	CSEg1104
5	LART1004	Geography of Ethiopia and the Horn	3	5	3	0	0	None
Total			**18**	**31**	**12**	**9**	**9**	

Year-II, Semester-II								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	ECEg2202	Electronic Circuit II	4	7	2	3	3	ECEg2101
2	ECEg2204	Signals and System Analysis	3	5	2	3	0	Math2101
3	EPCE2202	Electromagnetic Field	3	5	2	3	0	Math2101
4	ECEg2208	Engineering Application Software	1	3	0	0	3	None
5	Math-2103	Computational methods	3	5	2	0	3	Math2101
6	Math2201	Linear Algebra	3	5	2	3	0	None
Total			**17**	**30**	**10**	**12**	**9**	

Year-III, Semester-I								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	ECEg3201	Digital Logic Design	4	7	2	3	3	ECEg2201
2	EPCE3201	Network Analysis & Synthesis	3	5	2	3	0	ECEg2204
3	ECEg3103	Probability and Random Processes	3	5	2	3	0	Math1102
4	ECEg3205	Digital Signal Processing	3	5	2	3	0	ECEg2204
5	LART2002	General Psychology and Life Skills	3	5	3	0	0	None
6	Phys2208	Applied Modern Physics	3	5	2	3	0	Phys1101
Total			**19**	**32**	**13**	**15**	**3**	

Year-III, Semester-II								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	ECEg3202	Introduction to Communication Systems	4	7	2	3	3	ECEg2202
3	Phys3202	Solid State Physics	3	5	2	3	0	Phys2208
4	LART1003	History of Ethiopia and the Horn	3	5	3	0	0	None
5	Of selected course	Major Elective I	3	5	2	0	3	of selected course
6	of selected course	Major Elective II	3	5	2	0	3	of selected course
7	of selected course	Major Elective III	3	5	2	-	-	of selected course
Total			**19**	**32**	**13**	**6**	**9**	

Year-III, Semester-II: Major Elective								
Elective	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisite**
Major Elective I	ECEg3306	Microelectronic devices & circuits	3	5	2	0	3	ECEg2202
	ECEg3318	Optoelectronics	3	5	2	3	0	ECEg2202
Major Elective II	CSEg2202	Object Oriented Programming	3	5	2	0	3	CSEg1104
	SEng4208	Introduction to Artificial Intelligence	3	5	2	0	3	None
Major Elective III	EPCE3304	Introduction to control Systems	3	5	2	1	2	EPCE3201
	EPCE3302	Introduction to Electrical Machines	3	7	2	3	3	EPCE2202

Year-III: Summer Semester					
Course Code	**Course Title**	**Cr.hr**	**ECTS**	**Duration**	**Pre-requisite**
ECEg3200	Industry Internship – I	3	5	Two months	None

Year-IV, Semester-I								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisite**
1	ECEg4201	Computer Architecture And Organization	3	5	2	3	0	ECEg3201
2	ECEg4203	Digital Communication	3	5	2	0	3	ECEg3202
3	ECEg4205	EM Waves and Guide Structure	3	5	2	3	0	EPCE2202
4	SOSC5003	Entrepreneurship and Business Development	3	5	3	0	0	None
5	ECEg4206	Engineering Research and Development Methodology	2	3	1	3	0	Senior standing Course
6	of selected course	Major Elective IV	3	5	-	-	-	of selected course
Total			**17**	**28**	**10**	**9**	**3**	

Year-IV, Semester-I: Major Elective								
Elective	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisite**
Major Elective IV	EPCE3206	Introduction to power systems	3	5	2	0	3	EPCE3205
	EPCE3207	Electrical Measurement and Instrumentation	3	5	2	0	3	ECEg2202

Year-IV, Semester-II								
S/N	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
1	ECEg4202	Microprocessor & Interfacing	4	7	2	3	3	ECEg4201
2	ECEg4204	Antenna and Radio Wave Propagation	3	5	2	0	3	ECEg4205
3	ECEg4208	Data Communication and Computer Networks	3	5	2	0	3	ECEg4203
4	SOSC200 2	Introduction to Economics	3	5	3	0	0	None
5	IETP4203	Integrated Engineering Project	3					Senior standing Course
6	of selected course	Major Elective V	3	5	-	-	-	of selected course
Total			**19**	**30**	**10**	**6**	**9**	

Year-IV, Semester-II: Major Elective								
Elective	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisite**
Major Elective V	ECEg4310	Microwave Devices and Systems	3	5	2	0	3	ECEg4205
	ECEg4312	Integrated Circuit Technology	3	5	2	3	0	ECEg3306

Year-IV: Summer Semester					
Course Code	**Course Title**	**Cr.hr**	**ECTS**	**Duration (Days)**	**Pre-requisite**
ECEg4200	Industry Internship - II	3	5	Two months	ECEg3200

Year-V, Semester-I								
S/N	Course code	Course title	Cr.hr	ECTS	Lec.	Tut	Lab	Pre-requisite
1	ECEg5201	Wireless and Mobile Communication	3	5	2	0	3	ECEg4203
2	of selected course	Major Elective VI	3	5	2	0	3	of selected course
3	of selected course	Major Elective VII	3	5	2	0	3	of selected course
4	of selected course	Major Elective VIII	3	5	2	0	3	of selected course
5	of selected course	Free Elective I	3	5	2	0	3	of selected course
6	ECEg5203	Capstone Project	2	3	0	0	6	Accomplishment of all major courses
7	ECEg5207	Final year project Phase- I	2	3	0	0	6	
Total			**19**	**31**	**10**	**-**	**27**	

Year-V, Semester-I: Major Elective								
Elective	Course code	Course title	Cr.hr	ECTS	Lec	Tut	Lab	Pre-requisite
Major Elective VI	ECEg5307	VLSI Design	3	5	2	0	3	ECEg3201
	CSEg5307	Advanced Network	3	5	2	0	3	ECEg4208
Major Elective VII	ECEg5315	Embedded and real time systems	3	5	2	0	3	ECEg4202
	EPCE4302	Programmable Logic Controllers and Robotics	3	5	2	0	3	EPCE3204
Major Elective VIII	EPCE4306	Introduction to Mechatronics	3	5	2	0	3	None
	ECEg5321	Biomedical Instrumentation and Analysis	3	5	2	0	3	None
	EPCE3202	Power Electronics	3	5	2	0	3	ECEg2202

Year-V, Semester-II								
S/N	Course code	Course title	Cr.hr	ECTS	Lec	Tut	Lab	Pre-requisite
1	SOSC5011	Project Management for Engineers	2	3	2	0	0	None
2	of selected course	Major Elective IX	3	5	-	-	-	of selected course
3	of selected course	Major Elective X	3	5	-	-	-	of selected course
4	of selected course	Major Elective XI	3	5	-	-	-	of selected course
5	of selected course	Major Elective XII	3	5	-	-	-	of selected
6	ECEg5202	Final year project phase II	4	10	0	0	30	Completion of all major courses
Total			**18**	**33**	**-**	**-**	**-**	

Year-V, Semester-II: Major Elective								
Elective	**Course code**	**Course title**	**Cr.hr**	**ECTS**	**Lec.**	**Tut**	**Lab**	**Pre-requisite**
Major Elective IX	ECEg5302	Optics and Optical Communication	3	5	2	0	3	ECEg4203
	ECEg5304	Analysis & design of Digital integrated circuit	3	5	2	3	0	ECE3206
Major Elective X	ECEg5306	Telecommunication Networks and Switching	3	5	2	0	3	ECEg4203
	ECEg5308	Introduction to Computer Vision	3	5	2	0	3	ECEg4302
Major Elective XI	ECEg5310	Satellite Communication	3	5	2	0	3	ECEg4204
	ECEg5312	Digital Hardware Design	3	5	2	0	3	ECEg4201
Major Elective XII	ECEg5314	Digital Image Processing	3	5	2	0	3	ECEg3205
	ECEg5316	Semiconductor Devices	3	5	2	3	0	ECEg2201

10. Course Syllabus

Adama Science and Technology University		
1	College: **Freshman Division**	Department: **Pre-Engineering**
2	Course Category	Basic Mandatory
	Course Name	**Applied Mathematics I**
	Course Code:	**Math1101**
3	Synopsis:	Generally the Course Covers Basic Ideas and Principles of Vectors& Matrices of Linear Algebra and Basic ideas of Calculus. In Particular the course Contains principles of vectors , matrices & determinants, limit and continuity, derivatives & their applications, integrals, integration techniques and their applications
4	Academic Staff:	
5	Semester and Year offered:	Semester: I Year: 1
6	Credit Hour:	4
7	Prerequisite/ Co-requisite:	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to :	
	CLO-1	Apply the basic principles of vectors to solve the problems that needs concepts of vector operations
	CLO-2	Solve the system of linear equations by using matrix and determinant
	CLO-3	Evaluate basic limit and continuity problems
	CLO-4	Analysis the extremum values of a given system by using basic rules and principles of differentiation
	CLO-5	Use integration techniques and principles to solve integral problems; determine the volume, area , arc-length, surface area and center of mass of an object
	CLO-6	Apply rules and principles of vectors, matrix, determinant, derivative and integration to solve various applications problems in Engineering
9	Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment	

Course Learning Outcomes (CLO)	Students Outcome (SO)							Teaching Methods				Assessment					
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	L	T	P	O	Test I	Test II	Assignment I	Mid. Exam	Assignment	Final
CLO-1	√							√	√			√		√	√		√
CLO-2	√							√	√			√		√	√		√
CLO-3	√							√	√						√		√
CLO-4	√							√	√				√			√	√
CLO-5	√							√	√				√			√	√
CLO-6	√							√	√							√	√

Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)

	1	Mathematical skills that used to solve different practical engineering problems
	2	

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
			L	T	P	O			
	Chapter 1:Vector	CLO-1, CLO-6	7	3			1	12	23
	1.1 Definition of vectors							1	1
	1.2 Vector operations		1	1				1	3
	1.3 Norm of a vector		1					2	3
	1.4 Scalar product		1					2	3
	1.5 Projection of Vectors		1					2	3
	1.6 Cross product		1	1			1	2	5
	1.7 Lines and planes in space		2	1				2	5
	Chapter 2: Matrix and determinant	CLO-2, CLO-5	10	8			1	10	29
	2.1 Definition of matrix and types of matrix		1	1				1	3
	2.2 Matrices Operations		1	1				1	3
	2.3 Transpose of matrix		1	1				2	4
	2.4 Elementary row Operations		1	1				1	3
	2.5 Echelon form and rank of a matrix		1	1			1	1	4
	2.6 Inverse of a matrix and its Properties		2	1				1	4
	2.7 Determinant of a matrix and its properties		1	1				1	3
	2.8Solving systems of linear Equations 2.8.1 Cramer's rule 2.8.2 Gaussian's method 2.8.3 Inverse matrix method		2	1				2	5
	Chapter 3: Limit and Continuity	CLO-3, CLO-6	6	5			1	6	18
	3.1 Basic Concepts of limit		1	1				1	3
	3.2 Limit Theorems		1	1				1	3
	3.3 Asymptotes		1	1				1	3

	3.4 Formal definition of Limits		1	1			1	1	4
	3.5 Continuity		1	1				1	3
	3.6 Intermediate value Theorem		1					1	2
	Chapter 4: Derivative and Its Applications	CLO-4, CLO-6	8	8			1	10	30
	4.1 Definition of derivatives and rules of differentiation		1	1				1	3
	4.2 Higher order Derivatives			1				1	3
	4.3 Implicit Differentiation		1	1				1	4
	4.4Derivatives of inverse Functions 4.4.1 Inverse trigonometric functions and their derivatives 4.4.2 Inverse hyperbolic functions and their derivatives		2	1			1	2	7
	4.5 Applications of derivative 4.5.1 L'Hopital's Rule 4.5.2 Related rate 4.5.3 Extremum values of a function 4.5.4 First and second derivative tests 4.5.5 Concavity and inflection points 4.5.6 Curve Sketching		4	4			1	5	14
	Chapter 5: Integration and Its Applications	CLO-5, CLO-6	8	10			1	11	32
	5.1Anti-Derivatives; Indefinite Integrals		1	2				2	5
	5.2 Techniques of Integration		2	2				2	6
	5.3 Definite Integrals; Fundamental Theorem of Calculus		2	2				2	7
	5.4 Improper Integrals		1	2				2	6
	5.5. Application of Integration		2	2			1	3	8
		Total	39	39			5	49	132

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests (2)(5% each)	10%	√		2
2	Mid Exam	20%	√		3
3	Assignments(2)	20%		√	20
4	Total	25			

Final Exam	Percentage 50	F2F	NF2F	SLT

		(%)			
	Final Exam	50%	√		3
				Grand Total SLT	160
	L = Lecture, T = Tutorial, PBL = Problem based learning, GD = Group Discussion, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.				

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.
		2	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Robert Ellis and Denny Gulick, Calculus with analytic geometry, 6thed, Harcourt Brace Jovanovich, publishers
		2	Howard Anton, Elementary Linear Algebra with Applications 9th ed.
		3	Howard Anton, Calculus with Analytic Function, 5th ed.
		4	James Stewart, Calculus Early Transcendental,6th ed.
		5	Robert Ellis and Denny Gulick, Calculus with analytic geometry, 6thed, Harcourt Brace Jovanovich, publishers

Adama Science and Technology University						
1	College: Applied Natural Science		Department: Applied Physics			
2	Course Category	Basic Mandatory				
	Course Name	General Physics				
	Course Code:	Phys1101				
3	Synopsis:	This course provides science students with the basic concepts of physics that enable them to understand describe and explain natural phenomena. Emphasis is laid on general principles and fundamental concepts in measurements, mechanical and thermal interactions, fluid mechanics, electromagnetism, oscillations and waves with applications of physics in various fields of science. Permitting the students to voice and defend their own opinions and enhancing the students' commitment to individual study and acquiring knowledge. Active involvement of learners is required at each phase. This is done through questioning and answering, reflection, reporting, solving problems associated with the respective topics.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	1	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Knowledge in Higher Secondary Physics				
8	Course Learning Outcome (CLO) : At the end of the course the student will be able to:					
	CLO1	Recall basic physics by refreshing and summarizing the previous preparatory physics concepts before tackling the advanced physics courses.				
	CLO2	Acquire knowledge in kinematics and dynamics of particles in one and two dimensions and to explain the basic concepts of charges, fields and potentials.				

	CLO3	Elaborate the use and the working system of cells (batteries), resistors, generators, motors and transformers.
	CLO4	Understand the first law of thermodynamics for a closed system and apply it to solve problems.
	CLO5	Interpret systems that oscillate with simple harmonic motion.
	CLO6	Explain the application of physics in different sciences and technology fields.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (PO)															
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Test	Quiz	Assign ment	Project	Lab-report
CLO1	√	-	-	-	-	-	-	√	√	-	-	√	-	√	-	-
CLO2	-	-	√	-	-	-	-	√	√	-	-	√	√	√	-	-
CLO3	-	√	-	-	-	-	-	√	√	-	-	√	-	√	-	-
CLO4	-	-	√	-	-	-	-	√	√	-	-	-	-	√	-	-
CLO5	-	-	√	-	-	-	-	√	√	-	-	-	√	√	-	-
CLO6	-	-	-	-	-	-	√	√	-	-	-	-	-	-	√	-

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1. Apply the basic concepts and laws to practical situations
2. Develop the algebraic skills needed to solve theoretical and practical problems
3. Appreciate the applicability of physics to a wide range of disciplines

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Preliminaries		**2**	**3**	**-**	**-**	**4**	-	**9**
1.1 Physical Quantities and Units of Measurement	CLO1	2	2	-	-	1	-	9
1.2 Uncertainty in measurement and significant Digits	CLO1			-	-	1	-	

	1.3 Vectors: composition and resolution	CLO1		1	-	-	1	-	
	1.4 Unit Vectors	CLO1			-	-	1	-	
	Chapter 2: Kinematics and Dynamics of Particle		**4**	**6**	**-**	**-**	**9**	-	**19**
	2.1 Displacement, Velocity and Acceleration in 1D and 2D	CLO2	2	2	-	-	2	-	8
	2.2 Motion with Constant Acceleration	CLO2			-	-	1	-	
	2.3 Free Fall Motion & Projectile motion	CLO2		1	-	-	2	-	6
	2.4 Particle Dynamics	CLO2	2	2	-	-	2	-	10
	2.5 Planetary Motion	CLO2			-	-	1	-	
	2.6 Work, Energy and Linear Momentum	CLO2		1	-	-	1	-	5
	Chapter 3: Fluids Mechanics		**4**	**6**	**-**	**-**	**4**	-	**14**
	3.1 Properties of Bulk Matter /Stress, Strain	CLO3	2	3	**-**	**-**	1	**-**	7
	3.2 Density and Pressure in Static Fluids	CLO3			**-**	**-**	1	**-**	
	3.3 Buoyant Forces, Archimedes' principle	CLO3	2	3	**-**	**-**	1	**-**	7
	3.4 Moving Fluids and Bernoulli's Equation	CLO3			-	-	1	-	
	Chapter 4: Heat and Thermodynamics		**4**	**6**	-	-	**8**	-	18
	4.1 The Concept of Temperature: Zeroth Law of Thermodynamics	CLO4	2	3	-	-	1	-	9
	4.2 The Concept Heat and Work	CLO4			-	-	1	-	
	4.3 Specific Heat and Latent Heat	CLO4			-	-	2	-	
	4.4 Heat Transfer Mechanism	CLO4	2	3	-	-	1	-	9
	4.5 Thermal Expansion	CLO4			-	-	1	-	
	4.6 Energy Conservation: First Law of Thermodynamics	CLO4			**-**	**-**	2	**-**	
	Chapter 5: Oscillations, Waves and Optics		**4**	**6**	**-**	**-**	**7**	-	17
	5.1 Simple Harmonic Motion	CLO5	2	3	-	-	1	-	9
	5.2 The Simple Pendulum	CLO5			-	-	1	-	

	5.3 Wave and Its Characteristics	CLO5			-	-	2	-	
	5.4 Resonance, Doppler Effect	CLO5	2	3	-	-	1	-	8
	5.5 Image formation by thin lenses and mirrors	CLO5					2		
	Chapter 6: Electromagnetism and Electronics		**4**	**6**	-	-	**8**	-	**18**
	6.1 Coulomb's Law, Electric Fields & Electric Potential	CLO2	2	3	-	-	1	-	9
	6.2 Current, Resistance and Ohm's Law	CLO2			-	-	1	-	
	6.3 Electrical Power, Equivalent Resistance and Kirchhoff's Law	CLO2			-	-	2	-	
	6.4 Magnetic Field, Magnetic Flux & Electromagnetic Induction	CLO2	2	3	-	-	1	-	9
	6.5 Insulators, Conductors & Semiconductors	CLO2			-	-	1	-	
	6.6 Diodes Characteristics Curve & Transistors	CLO2			-	-	2	-	
	Chapter 7: Cross Cutting Applications of Physics		**4**	**6**	-	-	**6**	-	**16**
	7.1 Application in Agriculture	CLO6	2	3	-	-	1	-	8
	7.2 Physics and Industries	CLO6			-	-	1	-	
	7.3 Physics in Health Sciences and Medical Imaging	CLO6			-	-	1	-	
	7.4 Physics and Archaeology	CLO6	2	3	-	-	1	-	8
	7.5 Application in Earth and Space Sciences	CLO6			-	-	1	-	
	7.6 Application in Power Generation	CLO6			-	-	1	-	
	Total		**26**	**39**	-	-	**46**	-	**111**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz 1	10	√	-	30 minutes
2	Quiz 2	10	√	-	30 minutes
3	Assignment 1	5	-	√	1.5 hrs.
4	Assignment 2	5	-	√	1.5 hrs
5	Mid Test	20	√	-	2 hrs
Total					6 hrs.

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50	√	-	3 hrs.

		Grand Total SLT	**120 hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.		
12	Special requirements and resources to deliver the course (e.g., software, computer lab, simulation room …etc.)	1	White Board and Marker
		2	Power Point Projector
13	Text book and reference: (note: ensure the latest edition /publication)	1	Physics for Scientists and Engineers with modern Physics, Ninth Edition Raymond A.Serway and John
		2	University Physics with Modern Physics by Young, freedman and Lewis Ford
		3	Tayal D.C. Basic Electronics. 2nd ed. Himalaya Publishing House Mumbai, (1998).
		4	Fundamentals of physics by David Halliday, Robert Resnick and Gearl Walker

Adama Science and Technology University					
1	School: Applied Science			Department: Applied Chemistry	
2	Course Category	Basic Mandatory			
	Course Name	General Chemistry			
	Course Code:	Chem1101			
3	Synopsis:	The course is designed to study Properties, units and measurements; the composition of matter, chemical reactions, reactions stoichiometry, atomic structure and the periodic table, the chemical bond, structure of molecules, properties of solutions, chemical equilibria, introduction to functional groups and their typical reactions.			
4	Name(s) of Academic Staff:	All academic staffs of Applied Chemistry department			
5	Semester and Year offered:	Semester:	I	Year:	1
6	Credit Hour:	3			
7	Prerequisite/ Co-requisite: (if any)	None			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:				
	CLO-1	Apply common SI units of measurement to interconvert units of measurement.			
	CLO-2	Categorize elements based on electronic configuration.			
	CLO-3	Identify the chemical reaction types			
	CLO-4	Determine mass, % composition, empirical and molecular formulas by applying the mole concept			
	CLO-5	Predict atomic structure, chemical bonding or molecular geometry based on various models.			
	CLO-6	Describe chemical equilibria, colligative properties of solutions and functional groups			

9 Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Students Outcome (SO)						Teaching Methods				Assessment				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	L	T	P	O	Test	Quiz	Assignment	Project	Field-report
CLO-1	√						√					√			
CLO-2	√						√	√			√				
CLO-3	√						√					√			
CLO-4	√						√						√		
CLO-5	√						√						√		
CLO-6	√						√				√				

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	
2	
3…etc.	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
		L	T	P	O			
1. **Properties, Measurements and Units** 1.1. The Properties of Substances 1.1.1. Physical and Chemical Properties 1.1.2. Substances and Mixtures 1.2. Measurements and Units 1.2.1. The International System of Units 1.2.2. Extensive and Intensive Properties 1.2.3. Conversion Factors	CLO-1	2hr	1hr				3hr	6hr
1.2.4. The Reliability of Measurements and Calculations	CLO-1	1hr					3hr	4

	1.2.5. Significant Figures in Calculations								
	2. **The Composition of Matter** 2.1 Elements 2.1.1 The Names and Symbols of the Elements 2.1.2 The Periodic Table 2.2 Atoms 2.2.1 The Nuclear Atom 2.2.2 The Masses of Atoms 2.2.3 Moles and Molar Mass	CLO-2	2hr					3	5
	2.1 Compounds 2.1.1 Molecules and Molecular Compounds 2.1.2 Ions and Ionic Compounds	CLO-2	1hr					3	4
	3. **Chemical Reactions** 3.1. Chemical Equations 3.1.1.Symbolizing Reactions 3.1.2. Balancing Equations 3.2.Precipitation Reactions 3.2.1.Net Ionic Equations 3.2.2.Using Precipitation Reactions in Chemistry	CLO-3	2hr					3	5
	3.3. Acid-Base Reactions 3.3.1.Arrhenius Acids and Bases 3.3.2.Neutralization 3.3.3TheBrönsted Definition. 3.3.4.Lewis Acid. 3.4.Redox Reactions 3.4.1. Electron Transfer 3.4.2. The activity series Balancing reactions by using half-reactions	CLO-3	2hr					3	5
	4. **Reactions Stoichiometry** 4.1. Interpreting Stoichiometric Coefficients 4.1.1. Mole Calculations 4.1.2. Empirical & molecular formula Limiting Reactans 4.1.3. Chemical Compositions from Measurements of Mass	CLO-4	2hr	1hr				4	7

	1.1. The Stoichiometry of Reactions in Solution 1.1.1. Molar Concentration 1.1.2. The Volume of Solution Required for Reaction Titrations	CLO-4	2hr	1hr				4	8
	5. **Atomic structure and the periodic table** 5.1. Light and Spectroscopy 5.1.1. The Characteristics of Light 5.1.2. Quantization and Photons 5.2. The Structure of the Hydrogen Atom 5.2.1. The Spectrum of Atomic Hydrogen 5.2.2. Particles and Waves	CLO-2	3hr					3	6
	5.3. The Structure of Many-Electron Atoms 5.3.1. Orbital Energies 5.3.2. The Building –up Principle 5.4 A survey of Periodic Table 5.4.1 Blocks ,Periods, and Groups 5.4.2 Periodicity of Physical Properties Trends in Chemical Properties	CLO-2	1hr	1hr				3	5
	6. The chemical bond 1.1. Ionic Bonds 1.1.1. The Energetics of ionic Bond Formation 1.1.2. Ionic Bond and the Periodic Table	CLO-6	1hr					3	4
	1.1. Covalent Bonds 1.1.1. VSPER theory& Lewis Structures of Polyatomic Molecules 4.2.2 Resonance 4.2.3 Molecules with Multiple Bonds	CLO-5	1hr					4	5
	7. The Structures of Molecules • Bond Parameters • Charge Distributions in Compounds	CLO-5	2hr					3	5

	• Ionic versus Covalent Bonding • Assessing the Charge Distribution • The Valence-Bond Model of Bonding • Bonding in Diatomic Molecules • Hybridization • Molecular Orbital Theory • Molecular Orbitals Bonding in Period 2 Diatomic Molecules								
	8. The Properties of Solutions • Measures of Concentration • Emphasizing the Amounts of Solute in Solution • Emphasizing Relative Amounts of Solute and Solvent Molecules • Solubility • Saturation and Solubility • The Effect of Pressure on Gas Solubility • The Effect of Temperature on Solubility	CLO-6	2hr					4	6
	• Colligative Properties • Changes in Vapor Pressure, Boiling Points, and Freezing Points • Mixtures of Liquids • Raoult's Law for Mixtures of Liquids The Distillation of Mixtures of Liquids	CLO-6	2hr					5	7
	9. Chemical Equilibrium • The Description of Chemical Equilibrium • Reactions at Equilibrium • The Equilibrium Constant	CLO-6	3hr					4	7

	• Heterogeneous Equilibria • Equilibrium Calculations • Specific Initial Concentrations • Arbitrary Initial Concentrations								
	• The Response of Equilibria to the Reaction Conditions • The Effect of Added Reagent • The Effect of Pressure The Effect of Temperature	CLO-6	1hr					3	4
	10. Intrduction to Functional Groups and their typical Reactions • Alkanes, Alkenes and Alkynes • Aromatic compounds • Alcohols • Aldehydes and ketones • Carboxylic acids and their derivatives • Ethers Amines	CLO-6	3hr					6	9
	Total		33	4				64	111

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	10	30min		30min
2	Assignments	10		3hr	3hr
3	Quiz	5	30min		30min
4	Mid-Exam	20	1hr and 30min	2	1hr 30min
5	Quiz	5	30min		30min
				Total	6
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	3		3
				Grand Total SLT	120

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room etc.)	1	Choose an item.
		2	Choose an item.
		3	
		4	
		5	
13	Text book and reference: (note: ensure the latest edition /publication)	1	R. Chang, General Chemistry: The Essential Concepts, 8th Ed, 2008
		2	J.E. Brady, J. W. Russel and J. R. Holum, General Chemistry Principles and Structure 5th Ed, 2006.
		3	S. S. Zumdahl and S.A. Zumdahl, Chemistry, 7th ed., 2007

		4	J.W. Hill and R.H. Petrucci, General Chemistry: An Integrated Approach, 2nd ed., 1999.
		5	M. S. Silberberg; Principles of General Chemistry, 2007.

	Adama Science and Technology University	
1	**College : CoEEC**	**DEPARTMENT: CSE**
2	**Course Category:**	Basic Mandatory
	Course Title:	Introduction to Computing
	Course Code:	CSEg1101
3	Synopsis	In this course the basic techniques of computational problem solving will be covered by using computational thinking while writing small and medium sized programs, mapping problems into computational frameworks emphasizing on scientific problems, understanding problems and formulation of problems based on the elective programming language (using python). The course includes the concepts and techniques of data structure, input/output, flow control and incidental program, and by using a systematic division of problem solution and concept of module, to solve problems in numerical value field and non-numerical value field with program Experiment.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: I Year 1
6	Credit Hour:	3(2 hr Lec, 2Hr Lab)
7	Prerequisite:	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	

	CLO1	Develop simple algorithms from a natural language problem description, hence, express the art of computational problem solving using computational thinking.
	CLO2	Apply the principles of top-down design approach to translate algorithms to python program using IDE.
	CLO3	Utilize the concept of modules and function to solve a given problem
	CLO4	Use persistent data, basic searching and sorting algorithms, and data structure to solve a given problem
	CLO5	Practice different computational problem solving techniques
	CLO-6	Discuss the basic concepts of object-oriented programming.

9 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)									Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	L	T	P	O	Test	Quiz	Assignment	Project	Lab report		Final exam
CLO1	√									√		√	√			√				√
CLO2	√									√		√	√			√				√
CLO3	√									√		√	√		√	√	√			√

	CLO4	√									√		√	√				√			√
	CLO5	√									√		√	√				√			√
	CLO6		√								√		√	√			√				√
	Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box																				
10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)																				
11	**Distribution of Student Learning Time (SLT)**																				

	Course Content Outline	CLO	Teaching and Learning Activities						Tot
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	1. Chapter One: Introduction to computational thinking and programming	CLO -1	2		3		1	2	
	1.1. Introduction								
	1.2. What is computation?								
	1.3. Computational thinking								
	1.4. About python								
	1.5.Case study: 2D robot control								
	2. Chapter Two: Control structure	CLO -2	3		5		3	3	14
	2.1. Conditionals								
	2.2. Iterations								
	2.3. Case study: 2D robot control								
	3. Chapter Three: Working with objects, operators and expressions	CLO -6	2		4			2	10
	3.1. Objects: values and types								
	3.2. Variables								
	3.3. Operators and operands								
	3.4. Expressions								
	3.5. Case study: photo processing								
	4. Chapter Four: Functions	CLO -2, 3	2		4			3	10
	4.1. Basics of functions								
	4.2. Built-in functions and modules								
	4.3. User-defined functions								
	4.4. Case study: adding beeper to robot								
	4.5. Case study: triangular inequality								
	4.6. Case study: drawing different graphs								
	5. Chapter Five: Scope of variables and modules and, higher order	CLO -2, 3	2		4			4	12

	functions								
	5.1. Scope of a variable								
	5.2. More on module								
	5.3. Working with shapes								
	5.4. Working with higher order functions								
	5.5. Mutability of objects								
	5.6. Case study: sun animation								
	6. Chapter Six: Data structures	CLO-4	3		4			3	
	6.1. Working with tuples, strings , lists and dictionaries								
	7. Chapter Seven: Parameters, files, formatting and more on strings	CLO-4	3		3		2	3	11
	7.1. More on dictionaries								
	7.2. Named parameters								
	7.3. Files								
	7.4. String formatting								
	7.5. String methods 7.6. Case study: photo processing								
	7.6. Case study: photo processing								
	8. Chapter Eight: Sorting and Recursion	CLO-4	3		4		2	2	11
	8.1. Sorting in python								
	- Selection sort								
	- Bubble sort								
	8.2. Recursion								
	8.3. Case study: comparisons functions, palindromes, vegetable and fruit store								
	9. Chapter Nine: Searching and merge sort	CLO-4	2		4			2	9
	9.1. Divide and conquer								
	9.2. Binary search								
	9.3. Merge sort								
	9.4. Case study: data analysis and data plotting								
	10. Chapter Ten: Problem solving techniques	CLO-5	2		3			2	9
	10.1. Maximum subsequence problem								
	10.2. Brute force enumeration								
	10.3. Incremental computation								
	10.4. Divide and conquer								
	10.5. Case study: programming with global coordinate data, temperature data and HTML files								
	11. Chapter Eleven: Dynamic programming	CLO-5	2		2			2	7

11.1. What is dynamic programming?								
11.2. Fibonacci numbers revisited								
11.3. Case study: listing decision node s and function calls								
12. Chapter Twelve : Object-oriented programming concepts	CLO -6	2		2			2	8
12.1. Object-oriented programming								
12.2. Encapsulation								
12.3. Inheritance								
12.4. Case study: chicken family anim ation								
							Total	**12**

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	S
1	Quiz	5%	1	1	
2	Assignment	5%	1	3	
3	Project	15%	1	4	
	Mid Exam	25%	2	4	
				Total	
Final Exam		Percentage 40 (%)	F2F	NF2F	
Final Exam		40	3	10	
				Grand Total SLT	**150h**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	Python 3, PyCharm IDE, Python Imaging Library (Pillow), cs1graphics.py cs1robots.py, and cs1media.py
		3	
13	Text book and Reference:	1	Allen Downey, Jeffrey Elkner, How to Think Like a Computer Scientist: L with Python, Biolatera, 2002
		2	Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programm Introduction to Computer Science Using Python 3.6, 3rd Edition, Pr Bookshelf, 2017
		3	Online tutorials: e.g., http://tutorialspoint.com/python

Adama Science and Technology University		
1	**School**: Humanities and Social Science	**Department**: Humanities Unit
2	Course Category	General Course
	Course Name	**Communicative English Skills**
	Course Code:	**EnLa1001**

3	Synopsis:	Communicative English Skills is a course where students learn what they need to know for a career in Science. The course gives students the language, information, and skills they need to study science. It also provides students the language appropriate for studying science and real work situations as it comprises unique sections such as: **'it's my job'** wherein real people talk about their work in Science, **'listening'** whereby students are exposed to situations related to science dialogues, technical explanations, and interviews, **'reading'** whereby students meet a variety of science based texts, and the **'writing section'** which is designed to let students compose short reports on different activities.
4	Name(s) of Academic Staff:	TBA
5	Semester and Year offered:	Semester: I Year: 1
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	

CLO-1	Make presentations on a wide variety of natural science fields and situations. (PLO-10)
CLO-2	Listen to dialogues, technical explanations and interviews and identify the central message.(PLO-10)
CLO-3	Comprehend varieties of texts related to science. (PLO-10)
CLO-4	Recognize various aspects of words.(meaning, collocations, pronunciation, etc.) (PLO-10)
CLO-5	Compose short texts, reports, etc. (PLO-10)
CLO-6	Apply grammatical items for communications in science context. (PLO-10)

9 Mapping of the course Learning Outcomes to the Students outcome, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Students outcome (SO)															
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Assessment				
							L	T	P	O	Tes	Quiz	Assignment	Project/presentation	Lab-report
CLO-1						□			□					□	
CLO-2						□			□			□			
CLO-3						□			□		□		□		
CLO-4						□				□	□				
CLO-5						□	□		□				□	□	
CLO-6						□	□		□		□				

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Study skill
2	Listening skill

	3	Presentation skill							
	4	Writing skill							
11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Technology and Society 1.1 Listening: Technology & works	2			30’			2 hrs	2:30
	1.2 Language Spot: Comparison with adjectives and adverbs	6	1 hr		1hr			2 hrs	4 hrs
	1.3 Reading: Branches of technology	3			1 hr			2 hrs	3 hrs
	1.4 Speaking: satellite launch system	1			30’			2 hrs	2:30
	1.5 Vocabulary: Recording new words and word stress	4	1 hr		1 hr			2 hrs	4 hrs
	Chapter 2: Studying Technology 2.1 Reading: Civil Engineering	3			30’			1 hr	1:30
	2.2 Listening: The course	2			30’			1:30	2 hrs
	2.3 Language Spot: Present simple V Present continuous	6	30’		30’			2 hrs	3 hrs
	2.4 Pronunciation: Strong and weak forms of auxiliary verbs	4	30’		30’	1 hr		1:30	3:30
	Chapter 3: Design 3.1 Listening :The design process	2			30’			1 hr	1:30
	3.2 Language Spot: Question types	6	1 hr		30’			2 hrs	3:30
	3.3 Speaking: Using Non-specialist language	1			30’			2 hrs	3 hrs
	3.4 Listening: Working with design and problem solving	2			1 hr			2 hrs	3 hrs
	Chapter 4: Appropriate Technology 4.1 Reading: The inventor	3			30’			1 hr	1:30
	4.2 Language Spot: Time clauses	6	30’		30’			3 hrs	4 hrs
	4.3 Pronunciation: Number and quantities	4			1 hr	1 hr		2 hr	4 hrs

	4.4 Vocabulary: Describing motion	4	30’		1 hr			2 hr	3:30
	Chapter 5: Manufacturing 5.1 Listening: Manufacturing process	2			30’			1 hr	1:30
	5.2 Language Spot : Present passive	6	1 hr		30’			1:30	3 hrs
	5.3 Writing: Short sequence	5	30’		1 hr			2:30	4 hrs
	5.4 Vocabulary: Compound nouns	4	30’		30’			2 hrs	3 hrs
	Chapter 6: Transport 6.1 Reading: The car of the future	3			30’			1 hr	1:30
	6.2 Language Spot :Prediction will, may, might	6	30’		30’			1 hr	2 hrs
	6.3 Speaking: Making and acknowledging apologies	1			30’			2 hrs	3 :30
	6.4 Vocabulary :Recording new expressions	4	30’		1 hr			1 hr	2:30
	Chapter 7: Information Technology: 7.1 Reading :Computer use in the car industry	3			30’			1 hr	1:30
	7.2 Language Spot Past passive	6	30’		30’			1 hr	2 hrs
	7.3 Speaking :Working on a help desk	1			1 hr			2 hrs	3 hrs
	7.4 Vocabulary :Collocations and words ends with –ed	4	30’		1 hr			2 hrs	3:30
	Chapter 8: The future of Technology: 8.1 Listening: The prediction about technology	2			30’			1 hr	1:30
	8.2 Language Spot : Phrasal verbs	6	30’		1 hr			3 hrs	4:30
	8.3Vocabulary :Affixes	4	30’		1 hr			2 hrs	3:30
	8.4 Speaking :Saying goodbye	1			30’			2 hrs	3:30
	Total		10hrs		22:30	2hrs		57 hrs	91:30

	Assessment					
	Continuous Assessment		Percentage Total-60 (%)	F2F	NF2F	SLT
	1	Tests: (Vocabulary 5%, and Writing (1) 5%)	10	30’		30’
	2	Assignments: (Reading 5% and Writing 5%)	10		15 hrs	15 hrs
	3	Quizzes: (Listening (2) 10%	10	1 hr		1hr
	4	Presentation	10	3 hrs		3hrs
	5	Mid Exam (Reading 10% and Grammar	20	3 hrs		3 hrs

		10%)				
					Total	22:30 hrs
	Final Exam	Percentage 40 (%)	F2F	NF2F		SLT
	Final Exam	40	6 hrs			6 hrs
					Grand Total SLT	120 hrs
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	Software
		3	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Burns , Anne & Joseph S. 2018, International Perspectives on Teaching the Four Skills in ELT. Palgrave Macmillan. UK.
		2	Cystal, D. (1997).*English as a Global Language*: Cambridge University Press: Cambridge.
		3	Hewings, Martin & Simon H. 2015, Cambridge English Grammar and Vocabulary for Advanced. Cambridge University Press.
		4	Gideon (2015). *English Language And Grammar*: Koros Press Limited: United Kingdom.
		5	Palmer, Eric.2014, Teaching the Core Skills of Listening and Speaking. ASCD.USA.

	Adama Science and Technology University		
1	College: **Humanities and Social Science**		Department: Humanities Unit
2	Course Category	**General Course**	
	Course Name	Introduction to Ethics & Citizenship studies	
	Course Code:	**LART 1001**	
3	Synopsis	This course is designed for undergraduate students with the aim of familiarizinglearners to the essence of ethics and citizenship rights and responsibilities. It will helpstudents to acquire a necessary ethical qualities and civic competences while dealingwith issues that affect their society at all levels, country and human in general. The course starts with unfolding the notions, principles and theories of ethics which can shape our attitude, action and behavior in making moral judgment. Next, the course introduces learners to the nature, mutual interactions and historical evolutions of society, state, government and citizenship. It also elucidates issues pertaining to political governance such as constitution, democracy, and human rights in some details. To enable learners grasp basic knowledge of political, economic and social dynamics of international system in today's globalized world, the course also introduces international relations and foreign policy and other major contemporary global issues. In light of this, the course does not present mere theoretical knowledge, but also practical	

		knowledge of accentuating art of governing and protecting national interest in today's complex world.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: I Year 1
6	Credit Hour:	3
7	Prerequisite:	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Gain basic knowledge of ethics, and live up to expectations of ethical principles while executing their professions
	CLO2	Be equipped with ethical qualities and apply ethical values in making moral judgments and any other decisions that affect their day-to-day activities.
	CLO3	Understand theoretical discourses and practices of state and government, and their mutual interplay for building the best political order in today's complex international system
	CLO4	Develop analytical and reflective skills of identifying national and global development priorities in complement with human rights and democracy
	CLO5	Elucidate the rights and responsibilities attributed to citizens, and possess desirable knowledge, skills and commitment to exercise entitlements and discharge obligations in the realm of citizenship.
	CLO6	Develop intellectual and practical skills of foreign policy, diplomacy, and global trends to defend one's own national interest in international relations.
9	Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:	

Course Learning Outcomes (CLO)	Student Outcomes (SO)																
	SO1	SO2	SO3	SO4	SO5	SO6	Teaching Methods				Assessment						
							L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1							√	√			√	√	√				√
CLO2							√					√	√				√
CLO3							√				√	√					√
CLO4							√	√		√	√						√
CLO5							√	√		√			√				√
CLO6						√	√	√		√	√		√				√

Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	To have a sense of belonging to a common humanity, sharing values and responsibilities, empathy, solidarity and respect for differences and diversity.
	2	To acquire knowledge, understanding and critical thinking about global, regional, national and local issues and the interconnectedness and interdependency of different countries and populations.
	3	To analyze the dynamics of socio-economic and political transformation of their country.
11	**Distribution of Student Learning Time (SLT)**	
		Teaching and Learning Activities | Total

	Course Content Outline	CLO	Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	(SLT)
			L	T	P	O			
	Chapter one: Understanding Ethics and Morality 1.1. Defining Civics, Ethics, Morality and amorality Origin and Development of Civics and Ethical Education	1 &2	1 hr					1 hr	2 hr
	1.2. Approach to Ethics 1.2.1. Normative ethics ▪ Teleological Ethics (Consequentialist) 1.1. Deontological Ethics (Non-Consequentialist)	1&2	2 hr	2 hr		1 hr		2 hr	7 hr
	1.2.2. Non-Normative Ethics ▪ Meta Ethics ▪ Absolutism/Objectivism 1.2.3. Issues in Applied Ethics ▪ Development Ethics ▪ Environmental Ethics 1.2. Professional Ethics	1&2	2 hr	2 hr		1 hr		3 hr	8 hr
	1.4 Ethical Principles and Values of Moral Judgments 1.3. Why Should I act ethically?	1&2	1 hr					1 hr	2 hr
	Chapter Two: State and Government **2.1 Understanding State** ▪ Meaning and Attributes of State 1.4. Theories on the Origin and development of state	3	1 hr					2 hr	3 hr
	2.2. State Structures: Unitary; Federal and Con-federal	3	1 hr					2 hr	3 hr
	2.3. Understanding Government Major Function and Purpose of Government	3	1 hr					1 hr	2 hr
	2.4. Types of Government: Limited and Unlimited	3	1 hr					1 hr	2 hr
	3.1. 2.4. Systems of Government: Parliamentary, Presidential and Hybrid	3	1 hr					1 hr	2 hr
	Chapter Three: Citizen and Citizenship 3.1. Understanding Citizenship ▪ Citizen and citizenship: right and responsibilities 3.2. Competencies of Good Citizen	3&4	1 hr	1 hr				1 hr	3 hr

	3.3. 3.2 The Genesis of Citizenship: Normative and Historical Evolution of Citizenship	3&4	1 hr					2 hr	3 hr
	3.3. Approaches to citizenship: Liberal, Republican, Communitarian and Radical Democratic Ancient, Medieval, Modern and Cosmopolitan Citizenship	3&4	1 hr	1 hr				3 hr	5 hr
	3.4 Ways of Acquiring and Losing citizenship	3&4	1 hr					2 hr	3 hr
	4.2. 3.5 Citizenship in Ethiopia's Politico-Legal Context	3&4	1 hr					2 hr	3 hr
	Chapter Four: Constitution, Democracy and Human Rights **4.1. Constitution and Constitutionalism** ▪ Peculiar features of Constitution ▪ Major Purpose and Functions of Constitution ▪ Classification of Constitutions 4.3. The Constitutional Experience of Ethiopia: pre and post 1931	1,2,3 & 4	2 hr					2 hr	4 hr
	4.2. Democracy and Democratization ▪ Definitions and Forms of Democracy ▪ Views on Democracy: Substantive and Procedural Views ▪ Fundamental Values and Principles of Democracy ▪ Democratization and Its Waves Major actors in Democratization Process	1,2,3 & 4	2 hr			1 hr		3 hr	6hr
	4.3. Human Rights ▪ Definitions and Nature of Human Rights ▪ Basic Characteristics of Human Rights ▪ Dimensions of Human Rights The Protection and Promotion of Human Rights	1,2,3, 4,6	1 hr	1 hr		1 hr		2 hr	5 hr
	Chapter Five: Understanding International Relations and Foreign Policy 5.1. 5.1.The Nature and Evolution of International Relations	1,3,4 5&6	1 hr			1 hr		2 hr	4 hr
	5.2. 5.2.Actors of International Relations: State and Non-State Actors	1,3,4 5&6	1 hr					1 hr	2 hr
	5.3. 5.3.Levels of Analysis in the Interna	1,3,4	1					2 hr	3 hr

	tional Relation	5&6	hr						
	5.4.Contending Theories of International Relations ▪ Realism and Neo-Realism ▪ Liberalism and Neo-Liberalism ▪ Marxism and Neo-Marxism ▪ Critical Theory ▪ Constructivism Modernism and Post-Modernism	1,3,4 5&6	2 hr	2 hr		1 hr		4 hr	9 hr
	5.5 National Interest, Foreign Policy and Diplomacy ▪ Determinants of National Interest and Foreign Policy ▪ Objectives of Foreign Policy ▪ Foreign Policy Orientations Instruments of Foreign Policy	1,3,4 5&6	2 hr	1 hr		1 hr		3 hr	7 hr
	5.6 A Survey of Foreign Policy and Diplomacy of Ethiopia: Past and present	1,3,4 5&6	1 hr					2 hr	3hr
	Chapter Six: Major Contemporary Global Issues **Globalization and Regionalism** The Convergence, Divergence and Overlapping relations of Regionalization and Globalization	1,3,4 5&6	2 hr					2 hr	4 hr
	Survey of Contemporary Global Issues ▪ **Security Issues** ✓ Terrorism, Religious Fundamentalism and political Extremism ✓ Weapons of Mass Destruction and The Nuclear Power paradox Illicit Human Trafficking, Drug Trafficking, Firearms Trafficking	1,3,4 5&6	2 hr					2 hr	4 hr
	▪ **Environmental Issues** Climate Change and Global warming	1,3,4 5&6	1 hr					1 hr	2 hr
	▪ **Technology Related Issues** Cyber Crime and Cyber Security	1,3,4 5&6	1 hr					1 hr	2 hr
	▪ **Other Emerging Social, Economic and Political Issues** ✓ Migration and Refugee ✓ Trade War Epidemic and Pandemic Diseases COVID 19,	1,3,4 5&6,	1 hr					1 hr	2 hr

					Total	**48 hrs.**
	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Tests (2)	10	√		1hr
	2	Group assignments	10		√	8 hr
	3	Individual assignment	10		√	7 hr
	4	Mid exam	20	√		1 hr
					Total	**17hr**
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**2 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Adama Science and Technology university: Introduction to Civics and Ethics (Module) LAR 1011.
		2	Introduction to Global Trends module IRGI 1021
		3	

13	Text book and Reference:	1	Alexander, Larry (eds.).(1998). Constitutionalism: Philosophical Foundations. *Cambridge*: Cambridge University Press.
		2	Altinay, Hakan (2011) *Global Civics: Responsibilities and Rights in an Interdependent World.* The Brookings institution: Washington
		3	Barbelet, J.M. (1988) Citizenship. Minneapolis: University of Minnesota Press.
		4	Barber, Benjamin (1990) ‗Service, Citizenship, and Democracy. Civil Duty as an Entailment of Civil Rights', in Williamson Evers (ed.) National Service: Pro and Con. Stanford: Hoover Institution Press, pp. 27–43.
		5	Bellamy, R.2008. Citizenship: A Very Short Introduction. Oxford: Oxford University Press.
		6	Crawford, Robert (2000) *Idealism and Realism in International Relations: Beyond the Discipline.* Routledge: USA
		7	Fasil Nahum. 1997*. Constitution for a Nation of Nations: The Ethiopian Prospect*. Lawrenceville,NJ: Red Sea Publishers.
		8	Fishkin, James (1993) Democracy and Deliberation. New Haven, CN: Yale University Press.
		9	Francis Snare (1992). The Nature of Moral Thinking. Rutledge, U.S.A and Canada
		10	Genest, Mark A. (1996). Conflict and Cooperation: Evolving Theories of International Relations. Fourth Worth: Harcourt Brace and Co.
		11	Goldstein J. S. (2003) *International Relations*.5th edition. Washington, D.C. Pearson Education Press, Inc
		12	Griffiths, Martin (Ed.) (2007). International Relations Theory for the Twenty-First Century:An introduction. New York: Routledge
		13	John M.Rist Real Ethics. (2004).Reconsidering the Foundations of MoralityCambridgeuniversity press U.K and U.S.A

		14	Kymlicka, W. & Norman, W. (eds).2000. Citizenship in Diverse Societies.Oxford UniversityPress.
		15	Kymlicka, W. (1995) Multicultural Citizenship: A Liberal Theory of Rights. Oxford: Clarendon Press.
		16	Macedo, S. (2000).Diversity and distrust: civic education in a multicultural democracy. Cambridge, Mass: Harvard University Press.
		17	Mintz, Alex and Karl De Rouen (2010) *Understanding Foreign Policy Decision Making,* Cambridge University Pres: Cambridge
		18	Mouritzen, Poul (1987): The Demanding Citizen: Driven by Policy, Self-Interest, or Ideology? ‘, European Journal of Political Research 15 (4): 417–35.
		19	Munitz, Milton K., (ed.) (1961). A Modern Introduction to Ethics, The Free Press of Clencoe

Adama Science and Technology University						
1	College: **Humanities and Social Science**			Department: Humanities Unit		
2	Course Category	**General Course**				
	Course Name	**Physical fitness and conditioning I**				
	Course Code:	HPEd1011				
3	Synopsis:	This course will provide the students with basic concepts of the five components of health related physical fitness (cardiovascular, muscular strength and endurance, flexibility, and body composition), hypokinetic disease and general principles of training. It is mainly practical oriented. As a result, the students will be exposed to various exercise modalities, sport activities, minor and major games, and various training techniques as a means to enhance health related physical fitness components. In addition, they will develop the skills to assess each component of fitness and will practice designing cardiovascular, muscular strength and endurance, and flexibility programs based on the fitness assessment. The course serves as an introduction to the role of exercise in health promotion, fitness, performance including the acute and chronic responses of the body to exercise				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	1	
6	Credit Hour:	0 cr.hr				
7	Prerequisite/ Co-requisite: (if any)	None				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO-1	Understand the knowledge of physical fitness and its benefits.				
	CLO-2	Improve their physical fitness and wellness for better quality life.				
	CLO-3	Choose appropriate physical activity for their regular physical activity program.				
	CLO-4	Develop positive attitude towards physical activity and participation.				
	CLO-5	Develop positive social relationship and work cooperatively with others.				
	CLO-6	Develop skills to assess health related physical fitness components.				
9	Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:					

	Course Learning Outcomes (CLO)	Students Outcome (SO)														
		SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Assessment				
								L	T	P	O	Test	Quiz	Assignment	Project	Lab-
	CLO-1	√						√								
	CLO-2						√			√	√					
	CLO-3					√				√	√					
	CLO-4									√	√					
	CLO-5									√	√					
	CLO-6	√								√	√					
	Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box															
10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)															
	1	How to warm up their body before main exercise.														
	2	How to perform major fitness workout.														
	3…etc.	How to cool down their body after main exercise.														

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)		Guided Learning (NF2F)		Independent Learning (NF2F)		
		L	T	P	O			
Chapter One: Concepts of physical fitness	CLO 1							
1.1 Meanings and definitions of terms		1h					3h	4h
1.2 General principles of fitness training		1h					3h	4h
Chapter Two: The Health Benefits of Physical Activity	CLO 1 to CLO 6	2h						2h
2.1 Physical Activity and Hypokinetic Diseases/Conditions							4h	4h
2.2 Physical Activity and Cardiovascular Diseases,							4h	4h
2.3 Physical activity and postural deformity							4h	4h
Chapter Three: Making Well-`Informed Food Choices	CLO 1 to CLO 6	2h						2h

	3.1 Sound Eating Practices							2h	2h
	3.2Nutrition and Physical Performance							2h	2h
	3.2.1 Nutrition Before Exercise							2h	2h
	Chapter Four: Health related components of fitness and principles of exercise prescription	CLO 1 to CLO 6							
	4.1 Health Related Components of Fitness		2h					4h	6h
	4.2 Principles of exercise prescription for health and fitness		1h					3h	4h
	4.3 Individualizing workout		1h					2h	3h
	4.4 Means and methods of developing cardiorespiratory fitness				4h			6h	10h
	4.5 Means and methods of developing muscle fitness				6h			10h	16h
	4.6 Means and methods of developing flexibility				4h			6h	10h
	Unit Five: Assessment of fitness component	CLO 2 to CLO 6	2h						2h
	5.1 Evaluating Health Status								
	5.2 Assessment of cardiorespiratory fitness							2h	2h
	5.3 Assessment of Muscle Fitness							3h	3h
	5.4 Assessment of flexibility							2h	2h
	5.5 Assessment of body composition							2h	2h
	Total		12h		14h				90h

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	20%		6h	6h
2	Tests	10%	1h		1h
3	Tests	30%	1h		1h
				Total	8h
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam(practical)		40%	4h		4h
				Grand Total SLT	102h

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course	1	Choose an item.
13	Text book and reference: (note: ensure the latest	1	Dale B, Hahn (1999). Focus on health 2nd ed.
		2	Frank Gallugna (2000). Advanced PE for Edexcel.

	edition /publication)	3	Thomas D, Paul M, Walton T (2007). Fit & Well; Core Concepts and Labs in physical Fitness and Wellness 7th Edition

<table>
<tr><td colspan="11">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="5">College: Freshman Division</td><td colspan="5">Department: Pre-Engineering</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">Course Category</td><td colspan="8">Basic</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="8">Applied Mathematics II</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="8">Math 1102</td></tr>
<tr><td>3</td><td colspan="2">Synopsis:</td><td colspan="8">This course covers sequences, series, power series, Fourier series. Differential and integrals calculus of functions of several variables and their applications.The course aims to develop the basic ideas and methods of multi variable calculus, including the Taylor series of function, Fourier series, extrema, the examination of constrained maxima and minima using Lagrange multipliers and the integration of elementary functions of several variables. It aims to enable students to understand the extension from single variable to several variables of basic concepts such as continuity, differentiability and integration. Moreover, the course aims to strengthen the ability to apply mathematical concepts like partial differentiation and multiple integrals in computing some important quantities which will appear in engineering, such as rates of changes of quantities with several variables, the area and volume of physical bodies, the center of mass of some rigid body, and so on.</td></tr>
<tr><td>4</td><td colspan="2">Name(s) of Academic Staff:</td><td colspan="8"></td></tr>
<tr><td>5</td><td colspan="2">Semester and Year offered:</td><td colspan="2">Semester:</td><td colspan="2">II</td><td colspan="2">Year:</td><td>1</td><td></td></tr>
<tr><td>6</td><td colspan="2">Credit Hour:</td><td colspan="8">4</td></tr>
<tr><td>7</td><td colspan="2">Prerequisite/ Co-requisite:</td><td colspan="8">Applied Mathematics I (Math 1101)</td></tr>
<tr><td rowspan="7">8</td><td colspan="10">Course Learning Outcome (CLO): At the end of the course the student will be able to :</td></tr>
<tr><td>CLO-1</td><td colspan="9">Understand basics (of) and types of sequence and series and their properties</td></tr>
<tr><td>CLO-2</td><td colspan="9">Acquire the knowledge on power series and application of Taylor’s series.</td></tr>
<tr><td>CLO-3</td><td colspan="9">Know about Fourier series and half-range expansion.</td></tr>
<tr><td>CLO-4</td><td colspan="9">Solve different limit problems partial derivatives</td></tr>
<tr><td>CLO-5</td><td colspan="9">Formulate and solve different optimization problems.</td></tr>
<tr><td>CLO-6</td><td colspan="9">Evaluate multiple integral problems and understand its applications</td></tr>
<tr><td rowspan="3">9</td><td colspan="10">Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:</td></tr>
<tr><td rowspan="2">Course Learni</td><td colspan="9">Students Outcome (SO)</td></tr>
<tr><td>SO -1</td><td>SO -2</td><td>SO -3</td><td>SO -4</td><td>SO -5</td><td>SO -6</td><td>SO -7</td><td></td><td>Assessment</td></tr>
</table>

	ng Outcomes (CLO)								Teaching Methods				Test	Assignment	Mid-exam	Final Exam
									L	T	P	O				
	CLO-1	√							√	√			√	√	√	√
	CLO-2	√							√	√				√	√	√
	CLO-3	√							√	√					√	√
	CLO-4	√							√	√				√		√
	CLO-5	√							√	√			√	√		√
	CLO-6	√							√	√				√		√
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box															

10	Transferable Skills (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Computational Skill
	2	Problem Solving Skill

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Sequence and Series	CLO-5	7	7			2	9	25
	1.1. Definition of Infinite sequence		1	2					
	1.2. Convergence and divergence properties of series		1						
	1.3. Nonnegative term series and tests of convergence (integral, Comparison, Ratio and Root test)		2	2					
	1.4. Alternating series and alternating series test		1						
	1.5. Absolute and conditional convergence		1	2					
	1.6. Generalized convergence Test		1	1					
	Chapter 2: Power Series	CLO-5	8	8			2	8	26
	2.1. Definition of power		1	3					

	series at any point								
	2.2. Convergence and divergence, radius and interval of convergence of power series		2						
	2.3. Algebraic operation on convergent power series		1	5					
	2.4. Differentiation and integration of power series		2						
	2.5. Taylor series, Taylor polynomial and application		2						
	Chapter 3: Fourier Series	CLO-4	7	7			2	9	25
	3.1 Introduction to orthogonal functions		1	1					
	3.2. Fourier Series		1	3					
	3.3. Fourier series of odd and even functions		2						
	3.4. Half-range expansion		1	1					
	3.5. Fourier integral		2	2					
	Chapter 4: Differential Calculus of Functions of Several Variables	CLO-4	10	10			2	9	31
	4.1 Notations, Examples, level curves and graphs		1	1					
	4.2 Limit and continuity		1	1					
	4.3 Partial Derivatives, tangent lines, higher order partial derivatives		1	1					
	4.4 Directional derivatives and gradients		1	2					
	4.5 Total differential and tangent planes		1						
	4.6 Applications: Tangent plane approximation of values of functions		1	1					
	4.7 The chain rule, implicit differentiation		1	1					
	4.8 Relative extrema of functions of two variables		1	1					
	4.9 Largest and smallest values of a function on a given set		1	1					
	4.10 Extreme values under constraint condition: Lagrange's method		1	1					
	Chapter 5: Multiple Integrals	CLO-1	7	7			3	8	25
	5.1 Double integrals and their evaluations by iterated		1	2					

	integrals								
	5.2 Double integrals in polar coordinates		1						
	5.3 Applications: Area, center of mass of plane region		2	2					
	5.4 Triple integrals in cylindrical and spherical coordinates	CLO-3	1	1					
	5.5 Application: Volume, Center of mass of solid region		1	2					
	5.6 Change of variables in multiple integrals		1						
	Total		39	39			11	43	132

Assessment

	Continuous Assessment	Percentage Total-50(%)	F2F	NF2F	SLT
1	Test-1	5%	√		1
2	Test-2	5%	√		1
3	Assignment-1	10%		√	10
4	Assessment-2	10%		√	10
5	Mid-Exam	20%	√		3
	Total				25

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50%	√		3
			Grand Total SLT	**160**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		
13	Text book and reference: (note: ensure the latest edition /publication)	1	Robert Ellis and Denny Gulick, Calculus with analytic geometry, 6th edition
		2	Leithold, The calculus with analytic geometric, 3rd ed.
		3	R. T. Smith and R. B. Minton, Calculus concepts and connections, Mc Gram-Hill book company, 2006.
		4	D.V. Widder, Advanced calculus, Prentice-Hall, 1979.
		5	James Stewart, Calculus with analytic geometry, 7th ed.

	Adama Science and Technology University	
1	**College: CoEEC**	**DEPARTMENT: CSE**
2	**Course Category:**	Basic Mandatory
	Course Title:	Introduction to Emerging Technologies
	Course Code:	CSEg1102

3	Synopsis	This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality, Data Science and other technologies that have emerged over the past few years. Besides helping learners become literate in emerging technologies, the course will prepare them to use technology in their respective professional preparations.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	I	Year	1	
6	Credit Hour:	3				
7	Prerequisite:	None				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Identify different emerging technologies				
	CLO2	Recognize various emerging technologies and tools.				
	CLO3	Discuss ethical and professional issues of emerging technologies				
	CLO4	Differentiate different emerging technologies.				
	CLO5	Select appropriate technology and tools for a given task				
9	Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:					

Course Learning Outcomes (CLO)	**Student Outcomes (SO)**									Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√									√			√	√	√	√			√	√
CLO2	√									√			√	√	√	√			√	√
CLO3				√						√			√	√	√	√	√		√	√
CLO4	√									√			√			√	√		√	√
CLO5									√	√			√			√	√		√	√

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
1. Chapter One:Introduction to Emerging Technologies	CLO-1, 2	5				1	3	9

	1.1 Evolution of technologies Introduction to Industrial revolution o Historical background (IR 1.0, IR 2.0, IR 3.0) 1.5. o Fourth industrial revolution (IR 4.0)								
	1.6. 1.2 Role of data for Emerging technologies								
	1.7. 1.3 Enabling devices and networks for emerging technologies (programmable devices)								
	1.8. 1.4 Human to Machine Interaction								
	1.9. 1.5 Future trends in emerging technologies								
	1.10. Chapter 2 : Introduction to Data Science								
	2.1 Overview for Data Science o Definition of data and information o Data types and representation	CLO-2	6				1	2	9
	2.2 Data Value Chain o Data Acquisition o Data Analysis o Data Curating o Data Storage 1.11. o Data Usage								
	2.3 Basic concepts of Big data								
	Chapter 3: Artificial Intelligence(AI)	CLO-2	6				1	3	10
	3.1 Introduction to AI o What is AI o History of AI o Levels of AI 1.12. o Types of AI								
	3.2 Applications of AI o Agriculture o Health o Business (Emerging market) 1.13. o Education								
	1.14. 3.3 AI tools and platforms (eg: scratch/object tracking)								
	1.15. 3.4 Sample application with hands on activity (simulation based)								
	Chapter 4: Internet of Things(IoT)	CLO-2	6				0	3	9
	4.1 Overview of IOT								

	o What is IOT? o History of IOT o Advantages of IOT o Challenges of IOT 4.2 How IOT works o Architecture of IOT o Devices and network 4.3 Applications of IOT o Smart home o Smart grid o Smart city o Wearable devices o Smart farming								
	4.4 IOT tools and platforms (eg: KAA IoT /Device Hive/Zetta/Things Board…)								
	4.5 Sample application with hands on activity (eg IOT based smart farming)								
	5.1 Introduction to AR	CLO-2	6				1	3	10
	5.2 Virtual reality (VR) , Augmented Reality(AR) vs mixed reality (MR)								
	5.3 Architecture of AR systems.								
	5.4 Application of AR systems (education, medical, assistance, entertainment) workshop oriented hands demo								
	Chapter 6 :Ethics and professionalism of emerging technologies	CLO-3	5					1	6
	6.1 Technology and ethics Digital privacy								
	6.3 Accountability and trust								
	6.4 Treats and challenges								
	Chapter 7 Other emerging technologies	CLO-4, 5	8				2	5	15
	7.1 Nanotechnology								
	7.2 Biotechnology								
	7.3 Block chain technology								
	7.4 Cloud and quantum computing								
	7.5 Autonomic computing								
	7.6 Computer vision								
	7.7 Embedded systems								

	7.8 Cyber security								
	7.9 Additive manufacturing (3D Printing)								
								Total	**68 hrs.**

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	test	10	1	6	7
	2	Quize	05	1	3	4
	3	assignment I	10	2	6	8
	4	assignment II	10	2	6	8
	5	Mid exam	25	2	8	10
					Total	**37hr**
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40	3	12	15
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Adama Science and Technology university: Introduction to Civics and Ethics (Module) LAR 1011.
		2	Introduction to Global Trends module IRGI 1021
		3	
13	Text book and Reference:	1	Follett, J. (2014). Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things: O'Reilly Media.
		2	Jung, T., &Dieck, M. C. t. (Eds.). (2018). Augmented Reality and Virtual Reality: Empowering Human, Place and Business
		3	Vong, J., & Song, I. (2014). Emerging Technologies for Emerging Markets: Springer Singapore
		4	Del Rosal, V. (2015).Disruption: Emerging Technologies and the Future of Work. Emtechub.
		5	Mohamed Anis Bach Tobji, Rim Jallouli, Yamen Koubaa, Anton Nijholt Digital Economy. Emerging Technologies and Business Innovation, 2018

	Adama Science and Technology University	
1	**College: CoEEC**	**DEPARTMENT: CSE**
2	**Course Category:**	Basic Mandatory
	Course Title:	Fundamentals of Programming
	Course Code:	CSEg1104
3	Synopsis	The course is designed to introduce structured programming in C++ by providing an overview of programming concepts, on creating and working computer programs in C++. It will address fundamental concepts of program analysis, design,

		coding, testing and development. It includes introduction to computer programming; programming paradigms; algorithms and problem-solving; introduction to data structures and Programming constructs. The course is designed on how to solve business and scientific problems through the technique of structured programming. It will prepare students for focused studies in any programming language.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: II Year 1
6	Credit Hour:	3
7	Prerequisite:	Introduction to Computing
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	

CLO1	Describe problem solving process in science and engineering.
CLO2	Describe the basics of C++ programming-syntax and semantic elements of the programming.
CLO3	Use the control flow structures and functions to solve a given problem.
CLO4	Implement the basic data structure elements in C++ that serve as holding heterogeneous data primitives
CLO5	Develop a C++ program to implement file and stream objects using object oriented programming concepts.
CLO6	Develop a mini application that solves a real world problem using C++.

9 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)									Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√									√		√	√						√	√
CLO2		√								√		√	√			√			√	√
CLO3	√									√		√	√		√	√			√	√
CLO4		√								√		√	√			√	√			√
CLO5			√							√		√	√			√	√			√
CLO6			√									√					√			√

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
		Guided learning (F2F)	Guided Learning (NF2F)	Independent Learning (NF2F)	

			L	T	P	O			
	1. Chapter One: Problem Solving and Computer Programming	CLO-1, 2	6		3		3	4	16
	1.1. Problem solving life cycle								
	1.2. Basics of programming language								
	2. Chapter Two: Basics of C++ programming	CLO2, 4	3		3		3	3	12
	2.1. Modular program								
	2.2. The main function								
	2.3. Identifiers								
	2.4 Program output using cout ,Data types, Arithmetic operations, variables ,Assignment operations								
	3. Chapter Three: Input/output and Functions	CLO3, 4	3		3		3	3	12
	3.1. Using library functions								
	3.2. Input using the cin Object, Symbolic Constants								
	3.3. Writing Functions ,Variable Scope and life time								
	4. Chapter Four: Control Statements	CLO4, 5	3		3		3	3	12
	4.1. Branching structure								
	4.2. Looping Structure								
	5. Chapter Five: Arrays and Pointers	CLO4, 5	3		3		3	3	12
	5.1. Arrays								
	5.2. Pointers								
	6. Chapter Six: Files and Streams	CLO	6		3		3	3	15
	6.1. I/O File stream objects and functions								
	6.2 Reading and writing Character based files , Random file access								
	6.3. File Streams as function arguments								
	7. Chapter Seven: Structure and Object oriented programming	CLO4, 5	3		3		3	3	12
	7.1. Structure								
	7.2. Object Oriented programming								
	7.3. Representation of Graphs								
	7.4. Types of Graphs (cyclic and								

	acyclic, directed and undirected, complete and balanced)								
	7.5. Operation on Graphs								
	7.6. Graph Traversal (DFS, BFS)								
	7.7. Djikistra and Prims Algorithms								
	8. Chapter Eight: Advanced Sorting Algorithms	CL O5	3		3		3	3	12
	8.1. Quick Sort								
	8.2. Merge Sort								
	8.3. Shell Sort								
	8.4. Heap Sort								
								Total	**103 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	1	1	2
2	Assignment	10%	1	1	2
3	Mid Exam	25%	2	1	3
4	Project	10%	1	3	4
				Total	**11hr**
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		50	3	7	10
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	Software (Code Block)
		2	Computer Lab
		3	Visual Studio Code
13	Text book and Reference:	1	Sahni, S 2001. "Data Structures, Algorithms and Apllications in C++ WCB/McGraw-Hill.
		2	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
		3	Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss
		4	Cracking the Coding Interview by Gayle Laakmann McDowell
		5	MIT OpenCourseWare: Introduction to Algorithms
		6	https://leetcode.com/

Adama Science and Technology University			
1	**School**: Humanities and Social Science		**Department**: Humanities Unit
2	**Course**	**General Course**	

	Category				
	Course Name	**Intro to Logic and Critical thinking**			
	Course Code:	**LART 1002**			
3	**Synopsis:**	The main goal of the course is to improve critical and logical reasoning skills. Students will see how our ordinary intuitions on good or bad reasoning can be articulated explicitly in formal systems, and gain a new ability to evaluate arguments and reasoning they encounter every day with rigorous logical concepts and tools. As to the subject matter, it introduces systematic methods of reasoning, such as argument, deduction, induction, syllogistic, and propositional logic.			
4	**Name(s) of Academic Staff**:				
5	**Semester and Year offered**:	Semester :	I and II	Year:	1
6	**Credit Hour**:	3			
7	**Prerequisite/ Co-requisite:**	None			

8 **Course Learning Outcome (CLO): At the end of the course the student will be able to do:**

CLO-1	Appreciate the importance of logic and critical thinking
CLO-2	know how to construct valid arguments of their own
CLO-3	Analyze the proper use of language for effective communication
CLO-4	Apply logical rules and principles for evaluating arguments
CLO 5	Identify logical fallacies
CLO 6	Understand the significance of logical and critical attitude for science

9 **Mapping of the course Learning Outcomes to the** Students Outcome**, Teaching Methods and Assessment:**

Course Learning Outcomes (CLO)	Students Outcome (SO)														
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Assessment				
							L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO-1						✓	✓			✓	✓		✓		
CLO-2							✓						✓		
CLO-3							✓				✓		✓		
CLO-4					✓		✓				✓		✓		
CLO 5							✓			✓			✓		
CLO 6							✓				✓		✓		

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Develop the attitude of critical thinking
2	Logical reasoning

	3	Clear and accurate use of language							
11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: **Introduction: The Nature of Argument** 1.1 Arguments, Premises, and Conclusions	1	1hr			1hr		2 hours	4 hours
	1.2 Recognizing Arguments	1	1hr			1hr		1 hour	3 hours
	1.3 Deduction and Induction	1	1hr					1 hour	2 hours
	1.4 Validity, Truth, Soundness, Strength, Cogency	1	1hr			2hr		2 hours	5 hours
	Chapter 2: **Language: Meaning and Definition** 2.1 Cognitive and Emotive Meaning	1&3	1hr					2 hours	3 hours
	2.2 Intension and Extension of Terms	3	1hr					2 hours	3 hours
	2.3 Definitions and their Purposes	3	1hr					2 hours	3 hours
	2.4 Definitional Techniques	3	1hr			1hr		2 hours	4 hours
	2.5 Criteria's for Good Lexical Definitions	3&5				1hr		2 hours	3 hours
	Chapter 3: Informal Fallacies 3.1 Fallacies in General	5	1hr			1hr		2 hours	4 hours
	3.2 Fallacies of Relevance	4,5,6	1hr			1hr		2 hours	4 hours
	3.3 Fallacies of Weak Induction	3,4,5	1hr			1hr		2 hours	4 hours
	3.4 Fallacies of Presumption	4,5,6	1hr			1hr		2 hours	4 hours
	3.5 Fallacies of Ambiguity, and Grammatical analogy	1,3,5,6	1hr			1hr		2 hours	4 hours
	Chapter 4: **Categorical Propositions** 4.1 The Components of	1,4	1h			1hr		2 hours	4 hours

	Categorical Propositions		r						
	4.2 Quality, Quantity and Distribution	1,2,3,4,6	1hr			1hr		2 hours	4 hours
	4.3 Venn Diagrams and the Squares of Opposition	4&5	1hr			1hr		2 hours	4 hours
	4.4Three categorical operations	4	1hr					2 hours	3 hours
	Chapter 5: **Categorical Syllogism** 5.1 Standard Form, Mood and Figure	2,3,5	1hr			1hr		2 hours	4 hours
	5.2 Venn Diagrams	2,3,4,5	1hr			1hr		1 hours	3 hours
	5.3 Rules and Fallacies	4&5	1hr			1hr		2 hours	4 hours
	5.4 Reducing the Number of Terms	4&6				1hr		1 hours	3 hours
	5.5 Enthymemes and Sorites	2						2 hours	2 hours
	Chapter six: Propositional Logic 6.1 Symbols and Translation	1-6	1hr			1hr		2 hours	4 hours
	6.2 Truth Functions	2&4	1hr					2 hours	3 hours
	6.3 Truth Tables for Propositions and Arguments	1&3	1hr			1hr		2 hours	4 hours
	6.4 Indirect Truth Tables	4,5,6	1hr					2 hours	3 hours
	6.5 Argument Forms and Fallacies	2,3,4,5	1hr			1hr		1 hour	3 hours
	6.6 Natural Deduction	2,4,6	1hr					2 hours	3 hours
	Total		**26** hr			**22** hr		**53** hr	**101** hours

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	1 hour	10	✓		1 hour
2	7 hours	10		✓	10 hours
3	8 hours	10	✓		16 hours
4	1 hours	20	✓		1 hours
				Total	**17** hours
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50%	✓		2 hours
				Grand Total SLT	**120** hours

	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.		
12	Special requirements and resources to deliver	1	
		2	
13	Text book and reference: (note: ensure the latest edition /publication)	1	**Hurley, Patrick J.(1997) A Concise Introduction to Logic (6-12)th Edition. Belmarnt: Wadsworth Publishing Company.**
		2	Copi, Irving M.and Carl Cohen, (1990) Introduction to Logic, New York: Macmillan Publishing Company.
		3	Fogelin, Robert, J, (1987) Understanding Arguments: An Introduction to Informal Logic New York: Harcourt Brace Jvanovich Publisher.
		4	Guttenplan, Samuel: (1991) The Language of Logic. Oxford: Blackwell Publishers Stephen, C.(200) The Power of Logic. London and Toronto: Mayfield Publishing company.
		5	Simico, N.D and G.G James. (1983) Elementary Logic, Belmont, Ca: Wadsworth Publishing Company.

Adama Science and Technology University						
1	College: **Mechanical, Chemical and Materials Engineering**			Department:**Mechanical Engineering**		
2	Course Category	**Basic Mandatory**				
	Course Name	**Engineering Drawing**				
	Course Code:	**MEng 1032**				
3	Synopsis:	This course introduces importance of engineering drawing, and Basic Geometric construction, and theory of projections, theory and practices of Multi view representations, Pictorial drawings, Auxiliary and sectional view drawing using drawing instrument.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	1	
6	Credit Hour (Lec-Tut-Pra.):	3(2-0-3)				
7	Prerequisite/ Co-requisite: (if any)	**None**				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to :	
	CLO 1	Apply drawing conventions and standards in engineering drawings to effectively communicate with engineers.
	CLO 2	Apply methods and rules of construction for different types of geometrical shapes.
	CLO 3	Sketch multi-view drawings of given objects or pictorial drawing
	CLO 4	Draw pictorial drawings of objects from given multi-view drawings
	CLO 5	Draw auxiliary and sectional views as a supplement of multi-view drawings

9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:									
	Learning Outcomes	Student Outcomes (SO)								
		O	O	O	O	O	O	O		Assessment

									Teaching Methods				Mid Exam	Quiz	Assignment	Final exam
									L	T	P	O				
	CLO 1			√					√				√			√
	CLO 2		√						√		√		√	√		√
	CLO 3		√						√		√		√			√
	CLO 4		√						√		√				√	√
	CLO 5		√						√		√			√	√	√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Communication and Graphics Skill
	2	Fundamental knowledge of Engineering Drawing

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
		L	T	P	O			
CHAPTER 1: Introduction 1.1 Definition of Drawing 1.2 Types of Drawings 1.3 History of Technical Drawing 1.4 Applications of Engineers Drawing 1.5 Drawing Standards 1.6 Drawing Instruments	CLO 1	2		3		1	3	9
CHAPTER 2: Basic Geometric Constructions and Lettering: 2.1 Basic Geometry 2.2 Lines and their Types 2.3 Lettering	CLO 2	2		3		2	4	12
CHAPTER 3: Theory of Projections and Multi -View Drawings 3.1 Types and classifications of Projections 3.2 Choice of views 3.3 Laying out of views 3.4 Projection of lines 3.5 Planar and non-planar lines 3.6 Tangent surfaces, Fillets, Rounds and Run-outs	CLO 3	4		12		2	4	22

	CHAPTER 4: Pictorial Drawings 4.1 Comparison between multi-view and pictorial drawings 4.2 Axonometric drawing 4.3 Oblique and central projections 4.4 Isometric drawings 4.5 Oblique drawing	CLO 4	4		12		1	3	20
	CHAPTER 5: Auxiliary Views 5.1 Primary and secondary auxiliary views 5.2 Complete and partial auxiliary views	CLO 5	4		9		1	2	16
	CHAPTER 6: Sectional Views 6.1 Types of sections 6.2 Conventional representations section view 6.3 Sectional auxiliary views 6.4 Sections in pictorial drawings	CLO 5	4		12		2	5	20
	Total		**28**		**42**		**10**	**20**	**100**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	10%	√		2
2	Quiz	10%	√		2
3	Assignments	10%		√	9
4	Mid Exam	20%	√		3
				Total	16

Final Exam	Percentage (%)	F2F	NF2F	SLT
Final Exam	50%	√		4
			Grand Total SLT	**120**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Software
		2	Video Tutorial
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.

13	Text book	1. Theodore J. Branoff, Interpreting Engineering Drawings, 8th Edition, 2016. 2. Edinburgh Gate Harlow, Technical Drawing with Engineering Graphics,14th Edition, 2014.
	References:	1. David A. Madsen, David P. Madsen, Engineering Drawing & Design, 6th Edition, 2017 2. Frederick E. Giesecke, Alva Mitchell, Henry Cecil Spencer and Cindy M. Johnson Technical Drawing with Engineering Graphics, 15th edition, 2016. 3. M.L. Mathur and R.S. Vaishwanar, Engineering Drawing and Graphics. 3rd edition, Jain Brothers, 2013. 4. M. B. Shah and B. C. Rana, Engineering Drawing, 2nd Edition, 2009 5. Cecil H. Jensen, Jay D. Helsel, and Dennis Short, Engineering Drawing and Design, Aug 17, 2007 6. M.L. Mathur and R.S. Vaishwanar, Engineering Drawing and Graphics. 3rd edition,

		Jain Brothers, 2013

Adama Science and Technology University		
1	**School**: Humanities and Social Science	**Department**: Humanities Unit
2	Course Category	General Course
	Course Name	**Basic Writing Skills**
	Course Code:	**EnLa1002**
3	Synopsis:	Basic Writing Skills course aims at developing students' basic writing skills in Science Context. The course gives students the language writing skills they need to study Science. It contains *sentence level writing:* sentence structure, sentence types sentence combinations, common sentence errors (fragment, run on, comma splices, misplaced modifier, dangling modifier, faulty parallelism, faulty reference of pronoun, faulty agreement and shifts); *paragraph level writing:* the essence of a paragraph, components of a paragraph (topic sentence, supporting sentences, concluding sentence), characteristics of effective paragraph (unity, coherence and completeness) and the steps in writing a paragraph and types of a paragraph; essay level writing: structure of an essay, thesis statement and supporting paragraphs, types of essays and techniques of essay development.
4	Name(s) of Academic Staff:	TBA
5	Semester and Year offered:	Semester: II Year: 1
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	*Communicative English Skills (EnLa1001)*
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO-1	Write grammatically and structurally correct sentence (PLO-10)
	CLO-2	Identify and correct common sentence errors in paragraphs and essays(PLO-10)
	CLO-3	Write coherent, unified and complete paragraphs of different types in science context (PLO-10)
	CLO-4	Identify basic structures and elements of paragraph and essay (PLO-10)
	CLO-5	Write different types of essays in science context (PLO-10)
9	Mapping of the course Learning Outcomes to the Students outcome, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Students outcome (SO)						Teaching Methods				Assessment				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO-1						□	✓		✓		✓	✓			
CLO-2						□	✓		✓		✓	✓			

CLO-3						☐	✓		✓		☐		☐		
CLO-4						☐	✓		✓		☐	☐	☐		
CLO-5						☐	✓		✓				☐		

Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Writing Skills
2	Communication skill
3…etc.	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Sentence 1.1 Definition of Sentence	1	1:30		1 hr			1 hr	3:30hrs
1.2 Sentence Types	1	1:30		1 hr			1 hr	3:30hrs
Chapter 2: Combining Sentences 2. 1 Coordination	1	1 hr		1 hr			3 hrs	5 hrs
2.2 Coordinating Conjunction	1	30’		30’			1 hr	2 hr
2.3 Subordination Conjunction	1	30’		30’			1 hr	2 hr
Chapter 3: Common Sentence Errors 3.1 Fragment	1, 2	30’		30’			2 hrs	3 hrs
3.2 Run on & comma splice	1, 2	30’		30’			2 hrs	3 hrs
3.3 Misplaced modifier	1, 2	30’		1 hr			2 hrs	3:30
3.4 Dangling modifier	1, 2	30’		1 hr			2 hrs	3:30
3.5 Faulty parallelism	1, 2	30’		30’			2 hrs	3 hrs
3.6 Faulty reference pronoun	1, 2	30’		30’			2 hrs	3 hrs
3.7 Faulty agreement	1, 2	30’		30’			2 hrs	3 hrs
3.8 Shifts	1, 2	30’		30’			2 hrs	3 hrs
Chapter 4: Paragraph Writing 4.1 Paragraph Structure	3,4	1:30		2:00			5 hrs	8:30
4.2 Characteristics of effective Paragraph	3, 4	1:30		2:30			5 hrs	9:00
4.3 Steps in writing paragraph	3, 4	1hr		2:00			4 hrs	7 hrs
4.4 Types of paragraph	3, 4	1hr		2:00			4 hrs	7:00
Chapter 5: Essay Writing	3,4,5	30’		1 hr			5 hrs	6:30
5.1 Components of Essay	3,4,5	30’		1 hr			4 hrs	5:30
5.2 Essay outline	3,4,5	30’		1 hr			3 hrs	4:30
5.3 Types of Essay	3,4,5	30’		1 hr			3 hrs	4:30
Total		16		21:30			56 hrs	93:30

		hrs							

Assessment					
Continuous Assessment		Percentage Total-60 (%)	F2F	NF2F	SLT
1	Quizzes (Sentence (1) 5% and Paragraph (1) 5%	10	1 hr		1 hr
2	Test 1 (paragraph structure and elements 10%)	10	30’		30’
3	Assignments (paragraph (2) 10%, Essay (1) 10%)	20		16 hrs	16 hrs
4	Mid Exam (Sentence Level)	20	3 hrs		3hrs
				Total	20:30

Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
Final Exam	40	6 hrs		6 hrs
			Grand Total SLT	120 hrs.

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO’s numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	Software
		3	Choose an item.
		4	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Brandon, L. and Brandon, K. (2005).***Paragraph and Essays***. Boston: Wadsworth Cengage Learning.
		2	Erliana, Santi RahmadiN., Sabarun &M. Zaini Miftah.2014, Developing Sentences into Paragraph: Course material for Paragraph Writing. Genius Media Publishing
		3	Langan, John. 2010, Exploring Writing Sentences and Paragraphs. McGraw Hill. NY.
		4	Radford, Andrew. 2009, An Introduction to English Sentence Structure. Cambridge University Press, New York.
		5	Sherrise Roehr. USA. Murray, Neil. 2012, Cambridge University press. NY.

Adama Science and Technology University		
1	**School**: Humanities and Social Science	**Department**: Humanities Unit
2	Course Category	**General Course**
	Course Name	**Physical Fitness and conditioning II**
	Course Code:	HPEd1022
3	Synopsis:	This course is designed to acquaint freshman engineering and applied natural science students with the nature and scope of different ball games. It emphasize the value of establishing lifelong fitness using ball games as a means and focuses on the fundamental of volley ball, hand ball, basketball and football as a life time leisure activity also focuses on the development of personalized approach to healthy active living through participation in a verity of ball games that have the potential to engage students’ interest throughout their lives. Again the courses

		enables the participants enjoying practice and acquire proper technique and strategies associated with the ball games mentioned above and learn rules
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: II Year: 1
6	Credit Hour:	0 cr.hr
7	Prerequisite/ Co-requisite: (if any)	HPEd1011

8 Course Learning Outcome (CLO): At the end of the course the student will be able to do:

CLO-1	Understand the value of playing ball games and its basic rules. (WA 1)
CLO-2	Improve their physical fitness and wellness for better quality life. (WA 12)
CLO-3	Demonstrate basic techniques of volleyball, basketball, football and hand ball games. (WA 5)
CLO-4	Develop positive attitude and participate in deferent ball games. (WA 1)
CLO-5	Improve team work and show Respect to their colleagues. (WA 9)
CLO-6	Use their leisure time properly and appropriate safety measures in playing ball games. (WA 3)

9 Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Students Outcome (SO)						Teaching Methods				Assessment				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO-1	√						√								
CLO-2						√			√	√					
CLO-3					√				√	√					
CLO-4									√	√					
CLO-5									√	√					
CLO-6	√								√	√					

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Basic volley ball skills
2	Basic hand ball skills
3…etc.	Basic basket ball and Foot ball skills

11 Distribution of Student Learning Time (SLT)

		Teaching and Learning Activities	Total (SLT)

Course Content Outline	CLO	Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Volleyball	CLO 1 to CLO 6	1h						1h
1.1 Passing				2h			3h	5h
1.2 Serving				1h			2h	3h
1.3 6 vs 6 game				1h			2h	3h
Chapter Two: Hand ball	CLO 1 to CLO 6	1h						1h
2.1 Passing				2h			3h	5h
2.2 Receiving				1h			2h	3h
2.3 Shooting				1h			3h	4h
2.4 7 vs 7 game				1h			3h	4h
Chapter Three: Basket ball	CLO 1 to CLO 6	1h						1h
2.1 Passing				2h			3h	5h
3.2 Dribbling				2h			3h	5h
3.3 Shooting				1h			3h	4h
3.4 5vs 5 game.				1h			3h	4h
Chapter Four: football	CLO 1 to CLO 6	1h						1h
4.1 Passing				1h			3h	4h
4.2 Controlling				1h			2h	3h
4.3 Dribbling				2h			3h	5h
4.4 Heading				1h			2h	3h
4.5 Shooting				1h			2h	3h
4.6 Small sided games				1h			2h	3h
Total		4h		22 h				70h

Assessment

Continuous Assessment		Percentage Total- 60(%)	F2F	NF2F	SLT
1	Assignments	20%		4h	1
2	Tests	10%	1/2h		2
3	Tests	10%	1/2h		3
4	Mid exam	20%	1h		4
5	Choose an item.				5
				Total	6h

	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	4h		4h
					Grand Total SLT	80h
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.			
		2	Choose an item.			
		3	Choose an item.			
13	Text book and reference: (note: ensure the latest edition /publication)	1	Federation International de Volleyball (FIVB) Coaching Manual			
		2	International Handball Federation (IHF) Coaching Manual			
		3	Federation of International Basketball Association (FIBA)Coaching Manual			
		4	Federation of International Football Association (FIFA) Coaching Manual			

Adama Science and Technology University						
1	College: **Freshman Division**			Department: **Pre-Engineering**		
2	Course Category	Basic				
	Course Name	**Applied Mathematics –III**				
	Course Code:	**Math2101**				
3	Synopsis:	This course covers the topics in First order ordinary Differential Equation, second order ordinary Differential Equation , Laplace transforms and its application, scalar and vector fields and complex analytic function. Particularly, basic definitions and properties of linear and nonlinear, homogeneous and non-homogeneous differential equations, the Laplace transform of functions and the inverse Laplace transform will be discussed. Also different methods of solving an ordinary differential equations considered and practical problems in application of Engineering and Applied Science will be solved.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester :	I	Year:	2	
6	Credit Hour:	4				
7	Prerequisite/ Co-requisite:	Applied Mathematics-II				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:					

CLO-1	Classify ordinary differential equation and identify the method of solving each type of ordinary differential equations
CLO-2	Apply the method of solving ordinary differential equations to formulate and solve engineering problems
CLO-3	State Laplace transformation and the inverse Laplace transform of a functions and then apply it to solve Differential and an Integro-differential equation
CLO-4	Identify scalar and vector fields, state and apply Green's theorem, Gauss divergence theorem and stock's theorem in practical problems
CLO-5	Analyze the theory of Complex Analytic functions, Complex integrals and find integration of complex analytic function by a method of Residue

9 Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:=

Course Learning Outcomes (CLO)	Students Outcome (SO)															
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	Teaching Methods				Assessment				
								L	T	P	O	Test	Quiz	Assignment	Mid Exam	Final
CLO-1	√							√	√			√		√	√	√
CLO-2	√							√	√					√	√	√
CLO-3	√							√	√				√		√	√
CLO-4	√							√	√					√		√
CLO-5	√							√	√					√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Mathematical skills that used to solve different practical engineering problems
2	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Ordinary Differential Equation of the first order	CLO-1	6	6			2	9	23
1.1 Preliminary concepts		0.5						
1.2 Separable Equations		0.5					1	
1.3 Homogeneous Differential Equations		1	1				1	
1.4 Exact Differential Equations		1	1			1	3	
1.5 Non Exact differential equation and Integrating Factors		1.5	2				2	

	1.6 Linear differential Equation (with application)		1.5	2			1	2	
	Chapter 2: Ordinary Linear Differential Equation of the second order	CLO-2	9	9			3	9	30
	2.1 Homogeneous Linear Differential Equations of the second order		1					1	
	2.2 Homogeneous second order Differential Equations with constant coefficients		1.5	1			1	1	
	2.3 General Solutions, Basis		1	1				1	
	2.4 Real Roots, Complex Roots and Double Roots of the characteristic Equations		1.5	2				2	
	2.5 Method for solving non-homogeneous Linear Differential Equations		2	2			1	2	
	2.6 System of Differential Equation		2	3			1	2	
	Chapter 3:Laplace Transforms	CLO-3	6	6			2	8	22
	3.1 Laplace Transformations		2	1			1	2	
	3.2 Differential and Integration of Laplace Transformations		2	2			1	3	
	3.3 Convolution and Integral Equations		2	3				3	
	Chapter 4: Vector Calculus	CLO-4	12	12			3	10	37
	4.1 Scalar Field and Vector Fields		1						
	4.2Vector calculus		1	1				1	
	4.3 Curves, Arc Length and Tangent		2	1				2	
	4.4 Gradient of a scalar Field, Divergence and Curl of a Vector Field		2	1			1	1	
	4.5 Line Integrals, Line Integral Independent of Path and Greens Theorems		3	2			1	2	
	4.6 Surface Integrals, Gauss Divergence Theorem and Its Application		1.5	2				1	
	4.7 Stock's Theorems and Its Application		1.5	2			1	2	
	Chapter 5: Complex Analysis	CLO-5	6	6			2	6	20
	5.1Complex Analytic Functions		1					2	
	5.2 Complex Integrals		2	3			1	2	
	5.3 Integration by method of residue		3	3			1	2	

	Total		39	39			12	42	132

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests(2)	10%(Each 5%)	√		2
2	Assignments(2)	20%(Each 10%)		√	20
3	Mid-exam	20%	√		3
				Total	25
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50%	√		3
				Grand Total SLT	160

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.
		2	Choose an item.
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Erwin Kreyszing:AdvancedEngineering Mathematics
		2	Edwards and Penney : Calculus and Analytic Geometry.
		3	Zill D. G: A first course in differential equations with application. International edition,1981
		4	Kaplan W: Ordinary differential equations
		5	Martin R. H :Ordinary Differential equations
		6	M.D Raisinghania: Ordinary and partials Differential Equations

Adama Science and Technology University		
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	Electronics circuits I
	Course Code:	ECEg2201
3	Synopsis:	It introduces semiconductor devices, basic structure, principles, and operations. Analysis of BJT and FET basic operation with i-v characteristics and small signal analysis of BJT and FET. Application of semiconductor devices, BJT, and FET with real-time examples. Frequency Response of BJT and FET and various coupling methods. The basic construction of Amplifiers with various biasing methods and their application.
4	Name(s) of Academic Staff:	

5	Semester and Year offered:	Semester:	I	Year:	II	
6	Credit Hour:	4				
7	Prerequisite/ Co-requisite: (if any)	Math1101, Phys1101 and Co-requisite: Fundamentals of Electrical Engineering-EPCE2101				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Discuss basic semiconductor devices' working principles and structures with application.				
	CLO2	Discuss the characteristics of Semiconductor diodes, types of various semiconductor diodes, its characteristics with applications of each diode.				
	CLO3	Analysis of BJT with application and its various parametric representations.				
	CLO4	Analysis of FET with various biasing techniques, applications and parametric Representation.				
	CLO5	Explain the frequency response of amplifiers with various parameters and coupling Methods.				

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methodsand Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)											Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	TeachingMethods								
								L	T	P	O	Quiz	Laboratory	Assignment	Mid Exam	Final Exam
CLO1	√							√	√	√			√		√	√
CLO2	√					√		√	√	√			√	√	√	√
CLO3					√			√	√	√		√	√	√	√	√
CLO4						√		√	√				√	√		√
CLO5							√	√	√				√			√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Construction of basic electronic circuits
	2	
	3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning(F2F)				Guided Learning(NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Basic Semiconductor Theory**	CLO1	2hr	4hr	-		-	1hr	7hr
1.1. Semiconductor theory								

	1.2. Types of semiconductor materials								
	1.3. Pn-junction diode								
	Chapter 2: **Semiconductor Diodes and their Applications**	CLO2	6hr	9hr	9hr		4hr	4hr	28hr
	2.1. Characteristics of diodes								
	2.2. Analysis of diode circuits								
	2.3. Diode types								
	2.4. Applications of diode circuit								
	2.5. Voltage regulators								
	2.6. Power supplies								
	2.7. Wave shaping circuits								
	2.8. Voltage multiplier circuits								
	Chapter 3: Bipolar Junction Transistors	CLO 3	4hr	9hr	9hr	2hr	6hr		30hr
	3.1. Principle of operation and characteristics								
	3.2. BJT configurations								
	3.3. Biasing methods								
	3.4. Small Signal BJT amplifiers								
	3.5. parametric representation of BJT								
	Chapter 4: Field Effect Transistors	CLO 4	4hr	6hr			2hr	3hr	15hr
	4.1. FET Types								
	4.2. FET characteristics								
	4.3. Equivalent circuits and biasing techniques								
	4.4. Parametric representations								
	Chapter 5: Frequency Response of Amplifiers	CLO 5	2hr	4hr			6hr		12hr
	5.1. Basic concepts								
	5.2. Types of frequency response								
	5.3. Frequency response analysis of BJT								
	Chapter 6: Multistage Amplifiers	CLO 5	2hr	3hr			1hr	2hr	8hr
	6.1. Coupling methods								

	6.2. Analysis of gain and other parameters								
	6.3. Frequency response of multistage amplifiers								
	Total								100 hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5%	1hr		1hr
	2	Mid exam	20%	2hr		2hr
	3	Assignment	10%		4hr	4hr
	4	LAB	15%	6hr	4hr	10hr
					Total	17hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50%	3hr		3hr
					Grand Total SLT	120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to FaceNote: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliverthe course (e.g. software, computerlab, simulation room ...etc.)	1	simulation Software
		2	Circuits lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Textbook andreference: (note: ensure thelatest edition /publication)	1	Robert Boylestad, Louis Nashelsky: Electronic Devices and CircuitTheory,7th edition
		2	Jacob Millman, Microelectronics – Digital and Analog Circuits and Systems, McGraw-Hill series in electrical engineering, 1st Edition
		3	Electronic devices and circuits, Bell A David

	Adama Science and Technology University	
1	College: **COEEC**	Department: **EPCE**
2	Course Category	Basic Mandatory College Req.
	Course Name	**Fundamentals of Electrical Engineering**
	Course Code:	EPCE2101
3	Synopsis:	The course deals with basic concepts of electrical engineering, basic circuit law and circuit analysis methods, fundamental circuit theorems, transient circuit analysis, steady state circuit and power analysis, introduction to polyphase circuits, electromagnetism, and frequency analysis.

4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	I	Year	2	
6	Credit Hour:	4 (2hr Lecture, 3hr Tutorial and 3hr Laboratory)				
7	Prerequisite:	Maths1102 and Phys1101				

8 Course Learning Outcome (CLO): At the end of the course the student will be able to:

CLO1	Analyze fundamental and derived circuit laws, and analysis theorems of DC circuits
CLO2	Analyze first and second orders transient circuits
CLO3	Apply fundamental and derived circuit laws, and theorems to the analysis of AC steady state circuits
CLO4	Analyze a circuit to determine the instantaneous, RMS, maximum and average powers in AC circuits.
CLO5	Analyze basic polyphase circuits and calculate circuit parameters of balanced and unbalanced three phase circuits
CLO6	Discuss the basic concepts of electromagnetic phenomenon, and frequency response

9 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)																	
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment						
								L	T	P	O	Test	Quiz	Assignment	Project	Lab Exam	Mid exam	Final exam
CLO1	√	-	-	-	√	√	-	√	√	√	-	-	-	√	-	√	√	√
CLO2	√		-	-	√	√	√	√	√	√	-	-	-	√	-	√	√	√
CLO3	√	-	-	-	√	√	√	√	√	√	-	-	-	√	-	√	√	√
CLO4	√	-	-	-	√	√	√	√	√	√	-	-	-	√	-	√	-	√
CLO5	-	√	-	-	√	√	√	√	√	√	-		-	√	-	√	-	√
CLO6	-	-	-	-	√	√	√	√	√	-	-		-	√	-	-	-	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (Skills learned in the course of study which can be useful and utilized in other settings)

1 Basic electrical circuit analysis and connection skill

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						SLT
		Guided learning (F2F)				Guided learning (NF2F)		
		L	T	P	O			
Chapter One: Circuit laws and methods of analysis	CLO1	6	12	12		6	8	44hr
1.1 Basic Concepts Electrical quantities Basic circuit elements **1.2 Basic circuit laws Ohms law** Nodes, branches, and loops Kirchhoff's laws								

	Series resistors and Voltage divider rule Parallel resistors and current divider rule Star-delta transformation **1.3 Methods of circuit analysis** Nodal analysis: without and with a voltage source Mesh analysis: without and with current source **1.4 Circuit Theorems** Linearity property Superposition theorem Source transformation Thevenin's theorem Norton's theorems Maximum power transfer theorem								
	Chapter Two: First and Second Order Transient Circuit Analysis	CLO2	4	6	6	-	2	-	18hr
	2.1. First Order Circuits 2.2. Source free RL and RC circuits 2.3. Step response of RL and RC circuit 2.4. Second order circuits 2.5. Source free series and parallel RLC circuits 2.6. Step response of series and parallel RLC Circuits								
	Chapter Three: AC Steady State Analysis	CLO3	6	6	6	-	4	-	20hr
	3.1. Introduction to Sinusoids 3.2. Capacitors and inductors 3.3. Sinusoidal and complex forcing functions 3.4. Phasors and Phasor diagrams 3.5. Phasors representation for circuit elements 3.6. Impedance and admittance 3.7. AC circuit analysis techniques								
	Chapter Four: Steady State Power Analysis	CLO4	2	3	3	-	5	-	13hr
	4.1. Instantaneous power 4.2. Average power and maximum average power transfer 4.3. Effective or RMS value 4.4. Complex power 4.5. Power factor and power factor correction								
	Chapter Five:	CLO5	2	3	3	-	6		14hr

	Polyphase circuit								
	5.1. Three Phase Generator 5.2. Three phase connections 5.3. Source and load connection 5.4. Balanced and unbalanced three phase circuits 5.5. Power relationships in three phase system 5.6. Power Factor Correction								
	Chapter Six: Introduction to Electromagnetism	CLO6	2	3	3	-	4		12hr
	6.1. Introduction to electromagnetism 6.2. Mutual inductance 6.3. Magnetically coupled circuits 6.4. Energy analysis for Coupled circuit								
	Chapter Seven: Introduction to Frequency response	CLO6	2	3	3	-	4		12hr
	7.1. Introduction 7.2. Transfer function 7.3. Sinusoidal frequency analysis 7.4. Resonant circuits								
								Total	**133hr**

12	Assessment					
	Continuous Assessment		**Percentage Total-50(%)**	**F2F**	**NF2F**	**SLT**
	1	Assignment	10		√	10hr
	2	Lab Exam	15	√	√	12hr
	3	Mid exam	25	√		2hr
					Total	**24hr**
	Final Exam		**Percentage 50(%)**	**F2F**	**NF2F**	**SLT**
	Final Exam		50%	√		**3hr**
					Total	**160hrs**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face.					

13	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	Workshop
14	Text book	1	C. K. Alexander and M. N. O. Sadiku, fundamentals of circuit analysis, 10th edition, McGraw Hill,
	Reference: (note: ensure the latest edition /publication)	1	J. David Irwin, R. Mark Nelms, Basic engineering circuit analysis, 10th edition, John Wiley & Sons, Inc., 2011
		2	Robert Boylstad, Introductory circuit analysis, 10th edition, Pearson education, 2002
		3	A.E. Fitzgerald & D.E. Higginbotham, Arvin Grabel, Basic Electrical Engineering, 7th ed, Mcgraw hill companies, 2009
		4	Charles Seymour Siskind, Electrical Circuits, 2nd ed, McGraw-Hill,
		5	Cook and Carn, Elements of Electrical Engineering, 6th Edition, John Wiley & Sons, Inc.

	Adama Science and Technology University					
1	**College: CoEEC**		**DEPARTMENT: CSE**			
2	**Course Category:**	Basic Mandatory				
	Course Title:	Data Structures and Algorithms				
	Course Code:	CSEg2101				
3	Synopsis	The course covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems. Topics include basic data structures such as arrays, stacks, queues, and lists and advanced data structures such as trees and graphs. The algorithms used to manipulate these structures, and their application to solving practical engineering problems				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	I	Year	2	
6	Credit Hour:	3				
7	Prerequisite:	CSEg 1104 - Fundamentals of Programming				

8 Course Learning Outcome (CLO): At the end of the course the student will be able to:

CLO1	Describe the functions and applications of basic data structures.
CLO2	Analyze the performance of different algorithms in terms of time and space complexity.
CLO3	Apply the right kind of linear data structure for efficient problem solving.
CLO4	Apply the right kind of non-linear data structure for efficient problem solving.
CLO5	Discuss the runtime and memory efficiency of principal algorithms for sorting, searching, and hashing.

9 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)									Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	SO8	SO9	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√							√		√						√	√		√	√
CLO2		√				√				√					√	√	√		√	√
CLO3			√							√		√			√	√	√		√	√
CLO4			√			√		√		√		√					√		√	√
CLO5	√			√					√	√		√					√			√

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
		Guided learning (F2F)	Guided Learning	Independent Learning (NF2F)	

							(NF2F)		
			L	T	P	O			
	1. Chapter One: Introduction	CLO-1, 2	6		3		3	3	16
	1.1. Data structure definition, ADT, classification of Data structures(primitive vs. non primitive, properties of algorithm and expressing algorithms								
	1.2. Algorithm complexity analysis (operation count, big-O, theta, omega), best case analysis, worst case analysis, average case analysis								
	1.3. Linear vs nonlinear Data Structures), Array revision, pointer revision								
	2. Chapter Two: Simple Searching and Sorting Algorithms	CLO-2, 4	3		3		3	3	12
	2.1. Linear Search								
	2.2. Binary Search								
	2.3. Bubble sort								
	2.4. Insertion sort								
	2.5. Selection sort								
	3. Chapter Three: List Data Structure	CLO-3, 4	3		3		3	3	12
	3.1. List ADT by the array								
	3.2. Dynamic memory								
	3.3. Limitations of array								
	3.4. Implementation of Lists								
	3.5. Linked Lists								
	3.6. Operations of Linked Lists								
	4. Chapter Four: Stack Data Structure	CLO4, 5	3		3		3	3	12
	4.1. Stack Definition								
	4.2. Operations on Stack								
	4.3. Implementations of Stack using Array								
	4.4. Implementations of Stack using Linked Lists								

	4.5. Applications of Stack								
	5. Chapter Five: Queue Data Structure	CLO4, 5	3		3		3	3	12
	5.1. Queue Definition								
	5.2. Operations on Queue								
	5.3. Implementations of Stack Queue Array								
	5.4. Implementations of Queue using Linked Lists								
	5.5. Circular Queue								
	5.6. Priority Queue								
	5.5. Applications of Queue								
	6. Chapter Six: Tree Data Structure	CLO4, 5	3		3		3	3	12
	6.1. Tree Definition								
	6.2. Basic Terminolgies								
	6.3. Types of Tree (n-ary tree, binary tree, full BT, complete BT, balanced BT, BST, AVL tree)								
	6.4. Tree Traversal Methods								
	6.5. operation on Tree								
	6.2. Sheap Data Structure								
	7. Chapter Seven: Graph Data Structu re	CLO4, 5	3		3		3	3	12
	7.1. Graph Definition								
	7.2. Basic Terminologies								
	7.3. Representation of Graphs								
	7.4. Types of Graphs (cyclic and acyc lic, directed and undirected, complet e and balanced)								
	7.5. Operation on Graphs								
	7.6. Graph Traversal (DFS, BFS)								
	7.7. Djikistra and Prims Algorithms								
	8. Chapter Eight: Advanced Sorting Algorithms	CLO,5	3		3		3	3	12
	8.1. Quick Sort								
	8.2. Merge Sort								
	8.3. Shell Sort								
	8.4. Heap Sort								
								Total	**103 hrs.**

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Quiz	5%	1	1	2
	2	Assignment	10%	1	1	2

	3	Mid Exam	25%	2	1	3
	4	Project	10%	1	3	4
					Total	**11hr**
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40	3	7	10
					Grand Total SLT	**124hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Software (Code Block)
		2	Computer Lab
		3	Visual Studio Code
13	Text book and Reference:	1	Sahni, S 2001. "Data Structures, Algorithms and Apllications in C++ WCB/McGraw-Hill.
		2	Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
		3	Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss
		4	Cracking the Coding Interview by Gayle Laakmann McDowell
		5	MIT OpenCourseWare: Introduction to Algorithms
		6	https://leetcode.com/

Adama Science and Technology University					
1	**College**: Humanities and Social Science		**Department**: Humanities Unit		
2	Course Category	General Course			
	Course Name	**Geography of Ethiopia and the Horn**			
	Course Code:	LART1004			
3	Synopsis:	This course covers a brief description on the location, shape and size of Ethiopia as well as basic skills of reading map, the physical background and natural resource endowment of Ethiopia and the Horn which includes its geology and mineral resources, topography, climate, drainage and water resources, soil, fauna and flora. It also deals with the demographic characteristics of the country and its implications on economic development.			
4	Name(s) of Academic Staff:				
5	Semester and Year offered:	Semester:	II	Year:	1
6	Credit Hour:	3			
7	Prerequisite/ Co-requisite: (if any)	None			

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO-1	Demonstrate basic knowledge on the geographic attributes of Ethiopia and Horn.
	CLO-2	Acquire general understanding of physical geographic processes, and human-environment relationships.
	CLO-3	Develop ethical aptitudes and dispositions necessary to live in harmony with the natural environment
	CLO-4	Develop an understanding of national population distributional patterns and dynamics
	CLO-5.	Describe the comparative advantages of economic regimes; and understand the impacts of globalization.
	CLO 6	Identify their country's overall geographic conditions and opportunities;

9 Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Students Outcome (SO)														
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Assessment				
							L	T	P	O	Test	Quiz	Assi	Proj	Lab-report
CLO-1															
CLO-2															
CLO-3															
CLO-4															
CLO-5….															
CLO 6															

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Develop a map reading skill
2	Locate a place on a map using longitude and latitude

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)		Guided Learning (NF2F)		Independent Learning (NF2F)		
		L	T	P	O			
Chapter 1: Introduction 1.1. Geography: Definition, scope, themes and approaches	1	3	2				5	10
1.2 . Location, Shape and								

	Size of Ethiopia and the Horn								
	1.2.1. Location and its effects								
	1.2.2. The shape of Ethiopia and its implication								
	1.2.3. The size of Ethiopia and its implications								
	1.3. Basic Skills of Map Reading								
	Chapter 2: **The geology of Ethiopia and the horn** 2.1. NTRODUCTION	2	3	3				6	12
	2.2 The Geologic Processes: Endogenic and Exogenic Forces								
	2.3. The Geological Time scale and Age Dating Techniques								
	2.4. Geological Processes and the Resulting Landforms 2.4.1. The Precambrian Era geologic processes and resultant features								
	2.4.2. The Paleozoic Era geologic processes and resultant features								
	2.4.3. The Mesozoic Era geologic processes and resultant features								
	2.4.4. The Cenozoic Era geologic processes and resultant features								
	2.5. Rock and Mineral Resources of Ethiopia								
	Chapter 3: The Topography of Ethiopia and the Horn 3.1. Introduction	3	2	3				5	10
	3.2. Physiographic Divisions								
	3.2.1 The Western Highlands and Lowlands .								
	3.2.2 The Southeastern Highlands and Lowlands								
	3.2.3 The Rift Valley								
	3..3. The Impacts of Relief								

	on Biophysical and Socioeconomic Conditions								
	Chapter 4: Drainage systems and water resources of Ethiopia and the horn 4.1. Introduction	3	3	3				6	12
	4.2. Major Drainage Systems of Ethiopia								
	4.3. Water Resources: Rivers, Lakes, and Subsurface Water								
	4.4. General Characteristics of Ethiopian Rivers								
	4.5. Water Resources Potentials and Development in Ethiopia								
	Chapter 5: The climate of Ethiopia and the horn 5.1. Introduction	5	4	3				7	14
	5.2. Elements and Controls of Weather and Climate								
	5.3. Spatiotemporal Patterns and Distribution of Temperature and Rainfall in Ethiopia								
	5.4. Agro-ecological Zones of Ethiopia								
	5.5. Climate and its Implications on Biophysical and Socioeconomic Aspects								
	5.6. Climate Change/Global Warming: Causes, Consequences and Response Mechanisms								
	Chapter 6. : Soils, natural vegetation and wildlife resources of Ethiopia and the horn	6	3	3				6	12
	6.1. Introduction								
	6.2. Ethiopian Soils: Types, Degradation and Conservation								
	6.3. Types and Distribution of Natural Vegetation in Ethiopia								
	6.4. Natural vegetation: Uses, Degradation and Conservation Strategies								

	Chapter 7. Population of Ethiopia and the horn	4	5	5				10	20
	7.1 Introduction								
	7.2. Population Data: Uses and Sources								
	7.3. Population Dynamics: Fertility, Mortality and Migration								
	7.4. Population Distribution and Composition								
	7.5. Sociocultural Aspects of Ethiopian Population: Education, Health and Language								
	Chapter 8. Economic activities in Ethiopia	6	4	4				8	16
	8.1. Introduction								
	8.2. Mining, Fishing and Forestry								
	8.3. Agriculture in Ethiopian								
	8.3. 1.. Contributions, potentials and characteristics of agriculture in Ethiopia								
	8..32. Agricultural systems in Ethiopia								
	8.3.3. Major problems of Ethiopian agriculture								
	8.4. Manufacturing in Ethiopia								
	8.4.1. Manufacturing: essence and contributions								
	8.4.2. Types, characteristics and distribution of manufacturing								
	8.4.3. Industrial development in Ethiopia: Challenges and Prospects								
	8.5. The Service Sector in Ethiopia								
	8.5.1. Transportation and communication in Ethiopia: types, roles and characteristics								
	8.5.2. Trade in Ethiopia: types, contributions and								

	characteristics								
	8.5.3. Tourism in Ethiopia: Types, major tourist attraction sites, challenges and prospects								
	Total		27	26				53	106

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	15%	1		1
2	Assignments	10%	1	1	2
3	Tests	10%	1	1	2
4	Assignments	10 %	1	1	2
5	Quiz	5 %	1		1
				Total	14
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50 %	2	4	6
				Grand Total SLT	120

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.
		2	Choose an item.
13	Text book		Ministry of Science and Higher Education Moral and Civic Education Module.
	Reference	1	Morgan R.P.C (2005). Soil Erosion and Conservation. National Soil Resources Institute, Cornfield University. Blackwell Publishing, Oxford, UK
		2	Assefa M., Melese W., Shimelis G. (2014). *Nile River Basin; Eco hydrological Challenges, Climate Change and Hydro politics*. Springer International Publishing, Switzerland.
		3	Robert, E.G, James, F.P & L. MichaelT. (2007). *Essentials of Physical Geography*. Thomson Higher Education, Belmont, 8th edition...
		4	Addis Ababa University (2001*). Introductory Geography of Ethiopia*, Teaching Text, Department of Geography.

Adama Science and Technology University		
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	**Electronic circuits-II**

	Course Code:	ECEg2202
3	Synopsis:	Introducing feedback amplifier and the analysis of negative feedback amplifiers with various topologies and applications, More analysis of feedback amplifier withdifferential mode response and some other parameters. Introducing integrated circuit with various effective parameters and illustrate with real time applications.Introducing oscillators and different types of oscillator circuit with frequency determination and describe about multivibrator circuits with applications. Power semiconductor devices like SCR, TRIAC, DIAC devices with operation and characteristics. Explain in detail about single and double tuned amplifiers, ideal band pass amplifiers and power amplifiers.
4	Name(s) of Academic Staff:	TBA
5	Semester and Year offered:	Semester: II Year: II
6	Credit Hour:	4
7	Prerequisite/ Co-requisite: (if any)	Electronics circuits-I
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	

CLO1	Discuss about Negative feedback amplifier with different topologies and in detail about the analysis of negative feedback amplifiers.
CLO2	Analysis of Differential amplifiers with its applications.
CLO3	Illustrate the characteristics of operational amplifiers with real time examples
CLO4	Demonstrate the design of oscillator circuits, multivibrator circuits with examples and enforcing the students to design the oscillator circuits with different frequencies.
CLO5	Explain the power semiconductor devices and their characteristics, tuned amplifiers with various characteristics, power amplifiers.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methodsand Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)												Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7		TeachingMethods				Laboratory	Quiz	Assignment	Mid Exam	Final Exam
									L	T	P	O					
CLO1	√					√			√	√	√		√	√	√	√	√
CLO2	√								√	√	√		√		√	√	√
CLO3		√							√	√	√		√		√	√	√
CLO4			√						√	√	√		√		√		√
CLO5							√		√	√					√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Electronics circuits simulation and hardware lab
	2	
	3	

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: **Feedback Amplifiers**	CLO1	4hr	6hr	6hr		1hr	4hr	21hr
	1.1 Types of feedback, basic representation, topologies.								
	1.2 Analysis of feedback amplifiers								
	1.2 Effect of feedback on different parameters								
	Chapter 2: **Differential Amplifiers**	CLO 2	4hr	3hr	3hr		1hr	3hr	14hr
	2.1 Response for differential inputs								
	2.2 small signal analysis								
	2.3 Common mode rejection ratio, Constant current sources								
	2.4 Current mirror, Level shifter								
	2.5 Buffer circuits, Output driver circuit								
	Chapter 3: **Op-Amp Characteristics and Applications**	CLO 3	6hr	6hr	12hr		2hr	4hr	30hr
	3.1 Introduction								
	3.2 The ideal operational amplifier and								

	characteristics								
	3.3 Different Op amp configurations and analysis								
	Op amp applications Summer Difference Amplifier Integrator Differentiator Log and anti-log amplifier Inverse amplifier Voltage regulator								
	Chapter 4: **Oscillators & Wave shaping Circuits**	CLO 4	6hr	6hr	9hr		2hr	6hr	29hr
	4.1 Sinusoidal oscillators								
	4.2 Design of oscillator circuits with different frequencies								
	4.2 Wave form generator circuits- Schmitt triggers circuits								
	4.3 Multi-vibrators								
	4.4 Timer circuits								
	4.5 Sample and hold circuits								
	Chapter 5: **POWER SEMI CONDUCTOR DEVICES**	CLO5	6hr	3hr			3hr	8hr	20hr
	5.1 Types of power semiconductor devices								
	5.2 SCR construction and working with characteristic								
	5.3 SCR applications								
	5.4TRIAC construction, characteristic with applications.								

	5.5.DIAC construction characteristics with Applications.								
	Chapter 6: **Tuned and Power amplifiers**	CLO5	6hr	3hr			3hr	6hr	18hr
	6.1 Single and double tuned amplifier								
	6.2 Bandwidth, parallel andseries response								
	6.3 Ideal band pass Amplifier								
	6.4 Classification of poweramplifiers.								
	6.5 Analysis of poweramplifiers.								
	Total								132hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	1hr		1hr
2	Mid exam	20%	2hr		2hr
3	Assignment	10%		18hr	18hr
4	Laboratory	15%	2hr	2hr	4hr
				Total	25hr

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50%	3hr		3hr

	Grand Total SLT	160hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to FaceNote: indicates the CLO based on the CLO’s numbering in item 9.	

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation	1	simulation lab
		2	Computer lab
		3	Choose an item.

	Room …etc.	4	Choose an item
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Jacob Millman– Integrated Electronics , McGraw-Hill series in electrical engineering,1St Edition.
		2	Microelectronic Device and Circuits-2006 Electronic Edition- Clifton G. Fonstad
		3	Electronic devices and circuits, Bell A David

Adama Science and Technology University					
1	College: CoEEC		Department: ECE		
2	Course Category	Major Mandatory			
	Course Name	**Signals and Systems Analysis**			
	Course Code:	ECEg-2204			
3	Synopsis:	This course deals with the analysis of continuous-time and discrete-time signals and systems. Topics include: representations of linear time-invariant systems, representations of signals, Laplace transform, transfer function, impulse response, step response, the convolution integral and its interpretation, Fourier analysis for continuous time signals and systems and an introduction to sampling.			
4	Name(s) of Academic Staff:				
5	Semester and Year offered:	Semester:	II	Year:	II
6	Credit Hour:	3			
7	Prerequisite/ Co-requisite: (if any)	Applied Mathematics III- Math2101			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:				
	CLO1	Recognize, sketch and manipulate basic signals commonly used in engineering applications			
	CLO2	Formulate and solve differential equations describing linear, time invariant (LTI) systems, including both transient and steady-state responses			
	CLO3	Explain mathematical foundations of frequency- domain and time domain analysis techniques Fourier series.			
	CLO4	Fourier transform, applicable to continuous-time signals and systems and evaluate system property and limitation, fundamental problems in sampling			
	CLO5	Determine Laplace transforms with their properties by using the concept of ROC and relate with Laplace transform and elaborate a design state			
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:				

Course Learning Outcomes (CLO)	Student Outcomes (SO)														
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment			
								L	T	P	O	Test	Quiz	Assignm		Final Exam

CLO1	√					√	√	√	√					√	√	√
CLO2	√	√				√	√	√	√	√			√	√	√	√
CLO3	√	√				√	√	√	√	√		√		√	√	√
CLO4	√	√				√	√	√	√	√		√		√		√
CLO5	√	√				√	√	√	√	√						√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Introduction**	CLO1	2hr	-	-	-	1hr	5hr	10hr
1.1 Introduction to signal and systems								
1.2 Signal representation								
1.3 Classification Of Signals		2hr						
1.4 Basic Signals								
1.5 Operations On Signal								
Chapter 2: **Time-Domain Analysis of Continuous-Time Systems**	CLO2	2hr	2 hr	-	-	2hr	12hr	**24hr**
2.1 System Response to Internal Conditions: Zero Input Response								
2.2 The Unit Impulse Response								
2.3 System Response to External Response: Zero-State Response		2hr	2 hr					
2.4 The Convolution Integral								
2.5 Interconnected Systems								
2.6 Total System Response								
2.7 Differential and difference equation of LTI systems		2hr						
Chapter 3: **The Fourier Series**	CLO3	2hr		-	-	2hr	12hr	**22hr**
3.1 Introduction			2 hr					
3.2 Exponential form of Fourier series								
3.3 Trigonometric form of Fourier series		2hr						
3.4 Properties of Fourier Series								
3.5 Relationship between		2h						

	trigonometric and exponential Fourier series		r						
	Chapter 4: **The Fourier Transform**	CLO4	2hr		-	-	2hr	11hr	**21hr**
	4.1 Representation of Aperiodic Signals:			2 hr					
	4.2 The Fourier Transform for Periodic Signals		2hr						
	4.3 Properties of The Fourier Transform								
	4.4 Analysis and characterization of LTI system in FT		2hr						
	4.5 Inverse Fourier Transform								
	Chapter 5: **Sampling: Discrete Time Signals**	CLO4	2hr		-	-	2hr	5hr	**13hr**
	5.1 Introduction to Sampling Theorem								
	5.2 Signal Reconstruction		2hr						
	5.3 The Effect of Under Sampling			2 hr					
	Chapter 6: **The Laplace Transform**	CLO5	2hr		-	-	2hr	5hr	**15hr**
	6.1 The Laplace Transform								
	6.2 The Region of Convergence for Laplace Transforms		2hr						
	6.3 Some Laplace Transform Pairs			2 hr					
	6.4 Property of Laplace Transform								
	6.5 Inverse Laplace Transform		2hr						
	Total								**105hr**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1hr
2	Test	10%	√		1.5hr
3	Assignments I	5%		√	3 hr
4	Mid exam	20%	√		4 hr
5	Assignments II	10%		√	3.5 hr
				Total	**12hr**

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		√		**3hr**
			Grand Total SLT	**120hr**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB
		2	computer lab
		3	Choose an item.
		4	Signals and Systems, Second Edition, Simon Haykin and Barry Van Veen, John, Wiley & Sons, 2003
13	Text book and reference: (note: ensure the latest edition /publication)	1	Oppenheim, Alan V., Willsky, Alan S. with Nawab, S. Hamid *Signals & Systems*, 2nd Edition, Prentice-Hall 1997,
		2	Lathi, B. P. *Linear Systems and Signals*, 2nd Edition, Oxford University Press, 2005
		3	M.J.Roberts, "Signals & Systems Analysis using Transform Methods & MATLA B", Tata McGrawHill, 2007.

	Adama Science and Technology University					
1	College: **COEEC**			Department: **EPCE**		
2	Course Category	Basic Mandatory Department Req.				
	Course Name	**Electromagnetic Fields**				
	Course Code:	EPCE2202				
3	Synopsis	This course is deals with: review of Vectors and vector fields, Electrostatic Fields, Electric Fields in Material Body, Electrostatic Boundary-Value Problems, Magnetostatic Fields, Magnetic Forces & Materials, Forces due to Magnetics and Introduction to Time Varying Electromagnetic Fields				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	2	
6	Credit Hour:	3 (2hr Lecture, 3hr Laboratory)				
7	Prerequisite:	Maths2101				
8	Student Outcome (PO): Adopted from ABET					
	SO1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.				
	SO2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.				
	SO3	An ability to communicate effectively with a range of audiences.				
	SO4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.				
	SO5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.				
	SO6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions				
	SO7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.				
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Apply the basic concept of vector algebra to quantify the electrical effects of static charge				

		distributions in vacuum and material body
	CLO2	Apply the laws governing electrostatic to different charge distributions
	CLO3	Quantify and explain the effects of charges moving with uniform velocity
	CLO4	Apply the laws governing Magnetostatic to different Current carrying conductor geometry
	CLO5	Discuss elements of electrodynamics and summarize electromagnetism through Maxwell's equations.
	CLO6	Discuss how to generate Time Varying electromagnetic fields

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√	-	-	-	√		√	√	√	-	-	-	√	√	-	-	-	√
CLO2	√	-	-	-	√		√	√	√	-	-	-	√	√	-	-	-	√
CLO3	√	-	-	-	√		√	√	√	-	-	-	√	√	-	-	-	√
CLO4	√	-	-	-	√		√	√	√	-	-	√	-	√	-	-	-	-
CLO5	√	-	-	-	√		√	√	√	-	-	√	-	√	√	-	-	-
CLO6	√	-		-	√		√	√	√	-	-	-	-	-	√	-	-	-

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
		L	T	P	O			
Chapter One: Review of Vectors	CLO1	4	6			6	4	20hr
1.1. Scalar & Vector Fields 1.2. Coordinate system and transformation 1.3. Line, Surface, & Volume Integrals 1.4. Gradient of a Scalar field, Divergence & Curl of a Vector Field, the Divergence & Stokes's Theorems 1.16. Laplacian of a Scalar Field; Solenoidal & Irrotational Vector Fields and Helmholz's Theorem								
Chapter Two Electrostatic Fields	CLO2	4	6			5	5	20 hr
2.1. Introduction								

	2.2. Coulomb's Law, Electric Field and Electric Flux Density 2.3. Gauss's Law 2.4. Electric Potential; Relationship between Electric field & Electric Potential 2.5. Electric Dipole; 2.1. Energy in Electrostatic Fields								
	Chapter Three: 2.2. **Electric Fields in Material Body**	CLO3	4		6		5	5	20hr
	3.1. Introduction 3.2. Properties of materials 3.3. Convection and conduction currents 3.4. Conductors 3.5. Polarization in dielectrics 3.6. Dielectrics constant and strength 3.7. Linear, Isotropic and homogeneous dielectrics 2.3. Boundary conditions								
	Chapter Four **Magneto static Fields**	CLO4	4	6			3	2	15hr
	4.1. Biot-Savart Law and Ampere's Circuital Law 4.2. Magnetic Flux Density 4.3. Magnetic Vector Potential 3.1. Maxwell's Equation for Static Electromagnetic Fields								
	Chapter Five 3.2. **Magnetic Forces & Materials**	CLO5	4	6			2	3	15hr
	5.1 Introduction 5.2 Forces due to magnetic Fields 5.3 Magnetic torque and moment 5.4 Magnetic dipole 5.5 Magnetization in materials 5.6 Classification of magnetic materials 5.7 Magnetic boundary Conditions 5.8 Magnetic Energy 3.2.1.1. Faraday's Law of Magnetic Forces and Materials								
	Chapter Six **Introduction to Time Varying Electromagnetic Fields**	CLO6	2	3			3	2	10hr
	6.1. Introduction 6.2. Time varying electric and magnetic fields 6.3. Interaction of time varying								

	electric and magnetic fields 6.4. Continuity equations 6.5. Boundary conditions for time varying electromagnetic fields								
	Total								**100hrs.**

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5	√		1hr
	2	Presentation	5			4hr
	3	Assignment(s)	10		√	8hr
	4	Test(s)	10	√		2 hr
	5	Mid Exam	20	√		2hr
					Total	**17 hrs.**
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		
13	Text book	1	Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University Press, NewYork, 2001.
	Reference:	1	Hayt, W.H., Engineering Electromagnetics, 8th ed., McGraw-Hill, 2012.
		2	David J. Griffiths, Introduction to Electrodynamics, 3rd ed., Prentice-Hall, Inc., 1999.
	Policies		

14

Grading Policy

Grading of the course will be according to the university's rules and regulation.

Academic Integrity

ASTU values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism, and other academic offences under the Code of Student Conduct and Disciplinary Procedures.

Referencing style

The department of Electrical Power and Control Engineering advises students to use the "IEEE Referencing Style" for written work and oral presentations. However, students are permitted to use other recognized styles that appear in the Engineering literature.

Other Requirements

Students must attend at least **80% lecture** and **100% tutorial/Labratory** sessions except for some unprecedented mishaps.

This course is a basic course for other upcoming courses. Students are expected to attend all classes regularly and study from text books once the topic is discussed in classes. Students are advised to prepare for classes by reading the available materials before coming to classes and participate actively to enhance better understanding of the course and attain the learning outcomes.

There have been many reference books proposed for each topic which will be discussed in class. Students are encouraged to read and prepare based on the additional materials.

Irrespective of continues assessment result, a student must score a minimum of **40%** of the **final exam** to pass the course. (E.g., if final exam is out of **50** a student must score a minimum of **20**

	Adama Science and Technology University				
1	College: **COEEC**		Department: **ECE**		
2	Course Category	Major Mandatory			
	Course Name	**Engineering Application Software**			
	Course Code:	ECEg2208			
3	Synopsis	The course gives an introduction of the various engineering application software that are in use in the field of electronics and communication engineering. The fundamentals of MATLAB programming are illustrated with emphasis on features that are applicable to communication systems problems. Introduction: Matlab desktop environment, variables assignment, operations on variables, relational and numerical expressions, operations on vectors and matrices, data types and casting. Programming with MATLAB: MATLAB scripts, decision and loop statements. Data Structures: cell arrays, structures sorting and indexing. Plotting, File input/output: using plotting functions and customizing tools. Advanced Mathematicswith MATLAB**:** statistical functions, fitting data to a curve, system of linear equations, calculus with MATLAB. Discrete Time Signal and Systems with MATLAB: discrete time signal, operations on signals, discrete time systems (LTI)			
4	Name(s) of Academic Staff:				
5	Semester/Year offered:	Semester:	II	Year	2
6	Credit Hour:	1			
7	Prerequisite:	None			

9	Course Learning Outcome (CLO): At the end of the course the student will be able to:
CLO1	Identify and familiarize with important engineering application software.
CLO2	Discuss the basic features and recall the programming/simulation methodology of engineering application software.
CLO3	Interpret engineering problems into forms whose solutions can be found expediently and economically with the help of engineering application software.
CLO4	Analyze and interpret the programming/simulation outcomes.

10 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√						√					√	-		√		√	√
CLO2		√						√	√	√		√	-		√	√	√	√
CLO3							√					-	-		√	√	√	√
CLO4		√										√	-		√	√	-	√

Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)
1	MATLAB & Pspice programming Usage and Skill
2	

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1 **Introduction**	CLO1	1 hr		2hrs				3hrs
	1.17. Overview of Engineering Application Software								
	1.18. Features of Engineering Application Software: MATAB, Proteus, PSpice, µVision, Xilinx ISE								
	1.19. Application Examples of selectedengineering Softwares								
	Chapter 2 **Introduction to MATLAB**	CLO2	3 hrs		2hrs		5hrs	2hrs	12hrs
	2.1 The MATLAB Desktop Environment								
	2.2 Variables and Assignment Statements								
	2.3 Numerical Expressions								
	2.4 Relational Expressions								
	2.5 Built-in Numerical Functions								
	2.6 Vectors and Matrices Scalar and Array Operations on Vectors and Matrices 3.4. Matrix Multiplication								
	2.7 Data Types and Type Casting String Variables, Operation on Strings Conversion between String and Number Types								
	Chapter 3 **Introduction to Programming Using MATLAB**	CLO3	3 Hrs		2hrs		5Hrs	5hrs	15hrs
	3.1 MATLAB Scripts								
	3.2 Scripts with Input and Output								
	3.3 User-Defined Functions th at Returna Single Value								
	3.4 Selection Statements • The if Statement • The if-else Statement								

	• Nested if-else Statements The Switch Statement...								
	3.5 Loop Statements • The for Loop • Nested for Loops • While Loops • Loops with Vectors and Matrices								
	Chapter 4 Data Structures	CLO3	2 hrs		**3 hr**		5 Hrs	5Hrs	15hrs
	4.1 Cell Arrays								
	4.2 Structures								
	4.3 Sorting								
	4.4 Indexing								
	Chapter 5 **Plotting, File Input and Output**	CLO4	2 hrs		3hrs		4 hrs	6hrs	15hrs
	5.1 Plotting Functions and CustomizingPlots, Saving and Printing Plots								
	5.2 3D plots								
	5.3 Core Graphics Objects • Plotting from a Function Plotting File Data								
	5.3 Writing and Reading Spreadsheet Files								
	5.4 Lower-Level File I/O Functions								
	Chapter 6 **Advanced Mathematics With MATLAB**	CLO2, CLO3	3 Hrs		2 Hrs		5Hrs	5Hrs	15hrs
	6.1 Statistical Functions								
	6.2 Fitting Curves to Data								
	6.2 Matrix Solutions to Systems ofLinear Algebraic Equations								
	6.3 Calculus: Integration andDifferentiation								
	Chapter 7 **Discrete Time Signal and Systems with MATLAB**	CLO3	2 hrs		3 Hrs		8hrs	7hrs	20hrs
	7.1 Discrete time signal sequences:								
	7.2 Operations on signal sequences:								
	7.3 Discrete Time Systems								
	7.4 Discrete Time FourierTransform								
								Total	**95 hrs.**
	Assessment								

	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5	1hr		1hr
	2	Lab	10	5hr	3hr	8hr
	3	Assignment	10	1hr	10hr	11hr
	4	Mid Exam	25	2hr		2hr
					Total	Total
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	MATLAB Software
1.		3	

13	Text book Reference:	1	A Practical Introduction to Programming and Problem Solving, Stormy Attaway, Boston University, Fourth Edition
		2	MATLAB Recipes, A Problem-Solution Approach, Michael Paluszek and Stephanie Thomas, Apress
		3	Digital Signal Processing Using MATLAB, Vinay K. Ingle and John G. Proakis, BookWare Companion Series
		4	Modeling and Simulation of Systems Using MATLAB and Simulink, Dvendra K. Chaturvedi, CRC Press

	Adama Science and Technology University					
1	College: **COEEC**			Department: **EPCE**		
2	Course Category	Major Mandatory				
	Course Name	**Computational Method**				
	Course Code:	Math-2103				
3	Synopsis	The course deals with the following major points: - Number system and numerical error analysis, review of matrices, solution of linear equation, solution of nonlinear equation, approximation and interpolation techniques, and numerical differentiation and integrations.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	2	
6	Credit Hour:	3 (2hr Lecture, 3hr Laboratory)				
7	Prerequisite:	Maths2101				
8	Student Outcome (PO): Adopted from ABET					
	SO1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.				
	SO2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.				
	SO3	An ability to communicate effectively with a range of audiences.				
	SO4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global,				

		economic, environmental, and societal contexts.
	SO5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
	SO6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	SO7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Discuss different types of error, Significant figures, and number representation &Storage in Computers
	CLO2	Discuss basic concepts of matrices
	CLO3	Develop a program that will solve linear equations using direct, matrix, and iterative solution methods.
	CLO4	Identify and analyze different numerical methods for the determination of the roots of an equation and solve nonlinear equations.
	CLO5	Evaluate basic curve fitting using least square regression method and interpolation methods.
	CLO6	Analyze numerical solutions to solve differentiation, integration and ordinary differential equations.

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√	-	-	-	√	√	√	√	-	√	-	-	-	√		√	√	√
CLO2	√	-	-	-	√	√	√	√	-	√	-	-	-	√		√	√	√
CLO3	√	-	-	-	√	√	√	√	-	√	-	-	-	√		√	√	√
CLO4	√	-	-	-	√	√	√	√	-	√	-	-	-	√		√	-	√
CLO5	√	-	-	-	√	√	√	√	-	√	-	-	-	√		√	-	√
CLO6	√	-	-	-	√	√	√	√	-	√	-	-	-	-		√	-	√

Indicate the relevancy between the CLO and SO by ticking “√” on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB software skill

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Number system and numerical error analysis	CLO1	2		3		1	2	8hrs.
1.20. Introduction 1.21. Significant figures								

	1.22. Representation of Integers and Fractions 1.23. Number Representation and Storage in Computers								
	1.24. Source of errors and types of errors 1.24.1. Round-off error and Truncation Error 1.24.2. Error propagation								
	1.25. Algorithm for Conversion from one base to another								
	1.26. Computational Problems and Algorithms								
	1.27. Computational Efficiency								
	1.28. Computational Methods for Error Estimation (absolute error, relative error and percentage error)								
	Chapter Two: Review of Matrices	CLO2	2		3		1	2	6hrs.
	2.4. Elementary Properties of Matrices;								
	2.5. Orthogonality and Ortho normality of Vectors and Matrices;								
	2.6. Norm of Vectors and Matrices, System of Linear Equations								
	Chapter Three: Solution of system of linear Equations	CLO3	4		6		4	4	18hrs.
	3.3. Introduction								
	3.4. Existence and Uniqueness of Solutions								
	3.5. Methods of Solution of Linear Equations 3.5.1. Direct method 3.5.1.1. Elimination Method 3.5.1.2. Substitution Method 3.5.1.3. Cross multiplication Method 3.5.2. Matrix Method 3.5.2.1. Crammer's Rule 3.5.2.2. Gauss Elimination Method 3.5.2.3. Gauss-Jordan elimination Method 3.5.2.4. LU decomposition 3.5.3. Iterative methods 3.5.3.1. Jacobi Iterative Method 3.5.3.2. Gauss-Seidel Iterative								

	Method 3.5.3.3. SOR method								
	Chapter Four: Solution of Nonlinear Equations	CLO4	4		6		5	6	21hrs.
	4.1. Introduction								
	4.2.Root finding methods .2.1.Bracketing method 4.2.1.1. Graphical Method 4.2.1.2. Bisection Method 4.2.1.3. False –position Method 4.2.2. Open Methods 4.2.2.1. Simple Fixed-point Iteration method 4.2.2.2. Newton-Raphson Method 4.2.2.3. Secant Method								
	4.3.Multiple Roots								
	4.4.Roots of Polynomials 4.4.1. Convectional Method 4.4.2. Muller's Method								
	Chapter Five: Interpolation and Approximation	CLO5	4		6		5	6	21hrs.
	5.1.Introduction								
	5.2.Class of Common Approximation Functions								
	5.3.Criteria for the Choice of the Approximate Function								
	5.4.Piecewise Polynomial Approximation;								
	5.5. Curve fitting 5.5.1. Least –Square regression 5.5.1.1. Linear regression 5.5.1.2. Polynomial regression 5.5.1.3. Multiple regression 5.5.2. Interpolation 5.5.2.1. Newton's Divided – Difference 5.5.2.2. interpolating polynomial 5.5.2.3. Lagrange interpolating polynomial 5.5.2.4. Cubic Spline Interpolation								
	Chapter Six: Numerical Differentiation and Integration	CLO6	6		9		3	5	23hrs.
	6.1. Numerical Differentiation and Integration 6.1.1. Numerical Differentiation 6.1.1.1. High –Accuracy Differentiation formula								

	6.1.1.2. Richardson Extrapolation 6.1.2. Newton –Cotes Integration formulas 6.1.2.1. The Trapezoidal Rule 6.1.2.2. Simpson's Rules 6.1.2.3. Integration with Unequal Segment								
	6.2. Numerical Solutions of Differential Equations 6.2.1. Ordinary Differential Equations 6.2.1.1. Euler 's Method 6.2.1.2. Runge-Kutta Methods 6.2.2. Partial Differential Equations Finite Difference: Elliptic Equations 6.2.3. Finite difference: Parabolic Equations 6.2.3.1. Explicit Methods 6.2.3.2. A Simple Implicit Method 6.2.3.3. The Crank-Nicolson Method 6.2.4. Finite –Element method 6.2.4.1. One -Dimensional Problem 6.2.4.2. Two - Dimensional Problem								
	Total								**97 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Assignments	10	√	√	8hrs.
2	Lab-report	15	√	√	8hrs.
3	Mid Exam	25	√		2hrs.
				Total	**18 hrs.**
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer lab
		2	MATLAB simulation software

13	Text book	1	Chapra C.S. and Canale P.R., "Numerical Methods for Engineers with Programming and Software Application
	Reference:	1	Recktenwald, Gerald. Numerical Methods with Matlab, Prentice Hall, 2000.
		2	Erwin Kreysizg, Advanced Engineering Mathematics, 9th edition, Wiley,2005
		3	Brown, J. W. & Churchill, R. V, Complex Variables and Applications, 7th edition, 2003
		4	Steven C. Chapra , Computational methods for engineers,5th edition.
		5	Ralston A & P. Rabinowitz: A First Course in Numerical Analysis, 2nd ed, McGraw Hill,

		6	Mohammed Abdo, Introduction to Computational Methods.
		7	Jain M.K., S.R.K. Iyenger and R.K. Jain: Numerical Methods for Scientific and Engineering Computation, 2nd ed, Wiley Eastern Ltd., 1985

Adama Science and Technology University		
1	College: Applied Science	Department: Mathematics
2	Course Category	**Basic Mandatory**
	Course Name	**Linear Algebra**
	Course Code:	**Math 2201**
3	Synopsis:	This course deals with finite dimensional real vector spaces and linear transformations. It is an essential prerequisite for the proper comprehension of many branches of mathematics. Linear Algebra is also the ideal subject to introduce the student to the higher level of abstraction practiced in modern mathematics today.
4	Name(s) of Academic Staff:	Dr. Natea Hunde, Asnake Emana
5	Semester and Year offered:	Semester: II Year: 2
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	

CLO-1	Understand and apply basic ideas of Vector Algebra and Matrix Algebra to mathematical and physical problems
CLO-2	Solve systems of linear equations using Gaussian Elimination method and Cramer's rule
CLO-3	Find the row reduced echelon form of a matrix and also able to find eigen -value(s) and eigen-vector of a square matrix.
CLO-4	Understand the concept of a vector space over a field.

9

Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:=

Course Learning Outcomes (CLO)	Students Outcome (SO)														
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Assessment				
							L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO-1	√						√					√			
CLO-2				√			√	√			√		√	√	
CLO-3	√						√	√					√		
CLO-4	√						√	√							

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)

	1	Computation skills
	2	Ability or skill to handle abstract thinking or methods in mathematics
	3…etc.	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Vectors	CLO 1	3	2			`	1	6
1.1 Geometric and Co-ordinate representation of vectors		1	1					
1.2 Lines and Planes		1	1				1	
1.3 The Cross – product		1						
Chapter 2: Vector Spaces	CLO-4	6	4			1	3	14
2.1 Definitions and Examples		1						
2.2 Subspaces		2	1				1	
2.3 Linear combinations and generators		1	1				1	
2.4 Linear dependence and independence of vectors		1	1				1	
2.5 Basis and dimension of a Vector Space		1	1				1	
Chapter 3: Matrices	CLO-2 & CLO-3	9	6			1	3	19
3.1Operations with Matrices		1	1					
3.2Special Types of Matrices		1						
3.3 Non-singularity		`1	1				1	
3.4 Elementary Row and Column operations on Matrices		3	2				1	
3.5 Rank of a Matrix		1						
3.6 Applications to Systems of linear Equations		2	2				1	
Chapter 4: Determinants	CLO-2	9	6			1	3	19
4,1 Definitions and Examples		1						
4.2Co-factors and minors		3	2				1	
4.3Determinants of $n \times n$		2						

	matrices								
	4.4Adjoint of a Matrix		2	2				1	
	4.5Cramer's Rule		1	2				1	
	Chapter 5: Linear Transformations	CLO-1 & CLO-4	9	6			1	4	20
	5.1Definition and Examples		1						
	5.2 Kernel and Image		2	1				1	
	5.3The space of Linear Mappings		2					1	
	5.4 Inverse of Linear Mappings		2	2				1	
	5,5Linear Mappings associated with a Matrix		2	3				1	
	Chapter 6: Eigenvalues and Eigen Vectors	CLO-1 & CLO-3	6	4			1	2	13
	6.1 Introduction		1						
	6.2 The Eigen space of a linear operator		2	2				1	
	6.3 Eigenvalues and Eigenvectors of a Matrix		3	2				1	
	Total		42	28			5	16	91

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quizzes (2)	10	√		1
2	Tests (2)	20	√		3
3	Assignments	15		√	12
4	Project	5	√	√	10
5	Choose an item.				
Total					26

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50	√		3
			Grand Total SLT	120

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	Software (Mathematica or Maple)
		2	Computer Lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.

13	Text book and reference: (note: ensure the latest edition /publication)	1	An Introduction to Linear Algebra(DemissuGemeda, AAU press)
		2	Linear Algebra, 3rd edition(Serge Lang)
		3	

Adama Science and Technology University						
1	College: CoEEC			Department: ECE		
2	Course Category	Major Mandatory				
	Course Name	Digital Logic Design				
	Course Code:	ECEg3201				
3	Synopsis:	In this course, students will study various digital logic families such as TTL, ECL, and CMOS, the logic gates under these families, and the electronic circuit techniques used to implement them. Subsequently, they will learn Boolean algebra, logic expressions, number systems and combinational logic design, including logic minimization and hazards. In addition, with the understanding of combinational logic design, students will learn how to design sequential systems, including analysis of the behavior of synchronization elements and system timing design. Finally, in this course, students will have hands-on design experiences by carrying out experiments with component-level devices and designing digital systems.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	III	
6	Credit Hour:	4				
7	Prerequisite/ Co-requisite: (if any)	ECEg2201 Electronics Circuits I				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Distinguish the analog and digital systems and apply positional notations, number systems and computer codes in digital systems.				
	CLO2	Understand the concepts of a logic gates to construct various logic circuits				
	CLO3					
	CLO4	Design and implement combinational and sequential logic in digital systems				
	CLO5	Design shift registers for various applications in digital systems				
	CL06	Apply the concept of combinational and sequential circuits in memory devices				
	Mapping of the course Learning Outcomes to the student Outcomes, Teaching Methods and Assessment:					

9	Course Learning Outcomes (CLO)	Student Outcomes (SO)															
									Teaching Methods				Assessment				
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Laborator	Quiz	Assignme nt	Mid Exam	Final Exam
	CLO1	√							√	√						√	√
	CLO2	√	√			√			√	√	√		√		√	√	√
	CLO3	√	√		√	√			√	√	√		√	√	√	√	√
	CLO4	√	√	√	√	√	√	√	√	√	√		√	√	√		√
	CLO5	√	√	√	√		√	√	√	√	√		√		√		√
	CLO6			√	√	√	√	√	√	√			√				√
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Computer Systems
	2	Computer Architecture
	3	VLSI circuits and systems

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: INTRODUCTION, NUMBER SYSTEMS AND CODES	CLO1	6hr	6hr			2hr	1hr	15hr
	1.1 Analog Vs Digital Quantities and Representations								
	1.2 Advantages and limitations of Digital over analog system								
	1.3 Types logic Families								
	1.4 Decimal number AND Binary number								
	1.5 Decimal to binary conversation								
	1.6 Hexadecimal number								

	AND Octal number								
	1.7 1's and 2's compliment of binary number								
	1.8 BCD codes and its uses								
	Chapter 2: Digital Logic Gates	CLO2	6hr	3hr	6hr		2hr	3hr	20hr
	2.1 The NOT gate, logic symbol, output expression								
	2.2 The AND gate, logic symbol, output expression								
	2.3 The OR gate, logic symbol, output expression								
	2.4 The NAND gate, logic symbol, output expression								
	2.5 The NOR gate, logic symbol, output expression								
	2.6 The EX-OR AND EX-NOR gate, logic symbol, output expression								
	Chapter 3: Boolean algebra and Logic expression simplification	CLO3	6hr	6hr	3hr		2hr	3hr	20hr
	3.1 Boolean Operation and Expression								
	3.2 Basic Theorems, Laws and Rules of Boolean Algebra								
	3.3 Boolean Functions and Truth Tables								
	3,4 Standard and Canonical forms of Boolean Algebra								
	3.5 Simplification of Boolean Functions: Algebraic Simplification Karnaugh Maps Or K-Maps								
	3.6 Techniques for Minimal SOP and POS Forms								
	3.7 The Use of Don't Care Conditions								
	Chapter 4: Analysis and Synthesis of Combinational Logic Circuits	CLO4	6hr	3hr	6hr		2hr	3hr	20hr
	4.1 Design of Combinational Logic Circuits								
	4.2 Basic combinational logic circuits								

	4.3 Implementing Combinational logic								
	4.4 Universal property of NAND and NOR gates								
	4.5 Functions of combinational logic 4.5.1 Basic Adder 4.5.2 Comparator 4.5.3 Encoder and Decoder 4.5.4 Multiplexer and Demultiplexer 4.5.5 Parity generator/checker								
	Chapter 5: Sequential logic circuit	CL04	6hr	3hr	6hr		2hr	3hr	20hr
	5.1. Sequential logic circuit 5.1.1 Flip flops 5.1.2 Latches 5.1.3 Edge triggered flip flops 5.1.4 Master slave flip flops Applications								
	5.2. Counters 5.2.1 Asynchronous counters 5.2.2 Synchronous counters 5.2.3 Design of synchronous counters								
	Chapter 6: Shift registers	CL05	6hr	3hr	3hr		1hr	2hr	15hr
	6.1 Basic shift registers 6.2 Serial in serial out registers 6.3 Serial in parallel out Registers 6.4 Parallel in serial out Registers 6.5 Parallel in parallel out registers, Jonson's counter								
	Chapter 7 Memory and Programmable Logic	CL06	6hr	3hr	6hr		2hr	3hr	20hr
	7.1 Random-Access Memory 7.2 Memory Decoding 7.3 Read-Only Memory 7.4 Programmable Logic Array 7.5 Programmable Array Logic								
	Total								130hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz 1	5	1hr		1hr.
	2	Lab	15	8hr	7hr	15hr.
	3	Assignment	10	5hr	10hr	15hr.
	4	Mid Test	20	2hr		2hr
	Total					33 hr.
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			3hr		3hr
	Grand Total SLT					166 hr.
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					
	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software			
		2	Computer lab			
		3	Simulation Room			
		4				
		5				
	Textbook and reference: (note: ensure the latest edition /publication)	1	Morris M. Mano: Digital Design (4th Edition)			
		2	R. J. Tocci and N. S. Widmer: Digital Systems – Principles and Applications, 9th Ed, Prentice Hall, 2004			
		3	Stephen Brown, ZvonkoVranesic: Fundamentals of Digital Logic with Verilog Design, McGraw-Hill Science/Engineering/Math; 1st edition 2002			
		4	T.L. Floyd: Digital Fundamentals, 9th edition, Prentice Hall			

	Adama Science and Technology University	
1	College: **COEEC**	Department: **EPCE**
2	Course Category	Major Mandatory
	Course Name	**Network Analysis and Synthesis**
	Course Code:	EPCE3201
3	Synopsis	The course deals with the following major points: - Introduction to Network Analysis and Synthesis, network transform representations and analysis, network functions for one port and two ports, properties of driving point functions and transfer functions, calculation of network functions, poles and zeros, time domain behavior from pole-zero plot, elements of realizability theory, synthesis of one port networks using two kinds of elements, two-port networks and the

		relationship between transfer functions using two-port parameters and interconnection of two-port parameter, basics of filters, filter approximation, insertion loss synthesis and synthesis of active and passive networks and filters.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: I Year 3
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)
7	Prerequisite:	ECEg2204
8	Student Outcome (PO): Adopted from ABET	
	SO1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
	SO2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
	SO3	An ability to communicate effectively with a range of audiences.
	SO4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
	SO5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
	SO6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	SO7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Discuss the fundamental concepts and relevant technique in solving and analyzing different Electrical networks in different conditions
	CLO2	Apply mathematical knowledge to analyze and synthesize networks in time and frequency domain and estimate the performance of a particular network
	CLO3	Examine modeling techniques of active and passive electrical networks
	CLO4	Design one port and two port active and passive networks
	CLO5	Design of filters.
10	Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:	

Course Learning Outcomes (CLO)	**Student Outcomes (SO)**							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√	-	-	-	-	-	-	√	√	-	-	√	-	√	-	-	√	√
CLO2	√	-	-	-	-	-	-	√	√	-	-	-	√	√	-	-	√	√
CLO3	-	-	-	-	-	√	-	√	√	-	-	√	√	√	-	-	√	√
CLO4	-	√	-	-	-	-	-	√	√	-	-	-	√	√	√	-	-	√
CLO5	-	√	-	-	-	-	-	√	√	-	-	-	-	-	√	-	-	√

	Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box
10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other

	settings)	
	1	MATLAB software skill

No.	Distribution of Student Learning Time (SLT)								
11	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter One: Introduction to network analysis and synthesis	CLO1	2	4			2		8hr
	1.1. Introduction 1.2. Lumped analysis 1.29. Classification of networks								
	Chapter Two: Network Transform representation and analysis	CLO2	4	6			4	4	18hr
	2.1. Introduction Network Functions 2.2. Stability 1.30. Routh Hurtwitz Stability								
	Chapter Three: Elements of Realizability theory	CLO3	4	6			2	4	16hr
	3.1. Causality and Stability 3.2. Hurtwitz Polynomial 1.31. Positive real Function								
	Chapter Four: Synthesis of one port network with two kinds of elements	CLO4	4	6			4	6	20hr
	4.1.Synthesis of one port network L-C Immittance function 4.2.R-C Impedance or R-L admittance function R-L impedance or R-C admittance function								
	Chapter Five: Two Port Networks	CLO4	6	9			4	8	27hr
	5.1. Characterization of Linear time invariant (LTI) two port networks. Relation Between two port variables 5.2. Two port parameters Z, Y, T, H, G parameters 2.7. Interconnection of two port network								
	Chapter Six: Filter Synthesis	CLO5	4	6			3	3	16hr
	6.1. Low pass Filter synthesis 6.2. High pass Filter synthesis								

	Total									**105 hrs.**
	Assessment									
	Continuous Assessment		Percentage Total-50(%)					F2F	NF2F	SLT
	1	Test(s)	10					√		1hr
	2	Quiz	10					√		1hr
	3	Assignment	10						√	8hr
	4	Mid exam	20					√		2hr
									Total	12hr
	Final Exam		Percentage 50 (%)					F2F	NF2F	SLT
	Final Exam		50					√		**3 hrs.**
									Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face									

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer lab
		2	MATLAB simulation software

13	Text book/ Reference:	1	Circuits and systems, K.M. Soni, M E VanValkenburg, Network Analysis, Prentice Hall India
		2	Network analysis and synthesis, F.F.Kuo
		3	Circuits and networks analysis and synthesis,
		4	A Sudhakar, Shyammohan. Network theory and filter design, V. Aatre

Adama Science and Technology University						
1	College: CoEEC		Department: ECE			
2	Course Category	Major Mandatory				
	Course Name	Probability & Random Processes				
	Course Code:	ECEg3103				
3	Synopsis:	Introducing some application area of probability and random processes and revising Set theory, Function, Factorial, Permutation and Combination. Basic concept of Probability Theory: Probability models and axioms, Conditional probability, total probability, Independence and Bayes' the0rem. Random Variables, Probability Distributions and Densities function, Discrete and Continuous random variables, Gaussian Random Variable and Q-Function, Conditional Distribution and Density Function. Expectations, variances, moments, Expectation of a Function of Random Variable, Characteristic Function, Central Limit Theorem and Transformation of Random Variables. Two and more random variables and their joint distributions and densities. Random processes, Auto and cross correlation Functions, covariance, Stationary Random Processes, Ergodic Random Processes and Power Spectral Density Function. Introduction to parameter estimation and prediction.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year :	III	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Maths1102-Applied Mathematics II				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Discuss about fundamental of probability theory & random processes and illustrate these concepts with electrical engineering applications.
	CLO2	Characterize probability models and function of random variables based on single & multiples random variables.
	CLO3	Evaluate and apply moments & characteristic functions
	CLO4	Demonstrate basic principles of random variables and random processes needed in applications
	CLO5	Explain the concept of random processes and determine covariance and spectral density of stationary random processes.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Mid Exam	Final Exam
CLO1	√							√	√				√	√	√	√
CLO2	√							√	√			√		√	√	√
CLO3	√	√				√		√	√			√	√	√		√
CLO4	√	√						√	√			√		√		√
CLO5	√							√	√					√		√

Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB software
	2	
	3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
		L	T	P	O			
Chapter 1: **INTRODUCTION**	CLO1	2hr	1 hr			1hr	2hr	6hr
1.6 Application								
.7 Review of Set theory								
1.8 Review of								

	Factorial, Permutation and Combination								
	Chapter 2: **BASIC CONCEPTS OF PROBABILITY THEORY**	CL O2	5hr	5 hr			4hr	6hr	20hr
	2.1 Introduction								
	2.2 Experiment, Sample Space and Events								
	2.3 Discrete and Continuous Sample								
	2.4 Probability and Properties of Event								
	2.5 Axiom of Probability								
	2.6 Conditional Probability								
	2.7 Total Probability								
	2.8 Independent Events								
	2.9 Bayes's Theorem								
	Chapter 3: **RANDOM VARIABLES**	CL O2	7hr	7 hr			3hr	8hr	25hr
	3.1 Random Variables								
	3.2 Discrete and Continuous Random Variables								
	3.3 Probability Density Function								
	3.4 Cumulative Distribution Functions								
	3.5 Joint Probability Density and Distribution Functions								
	3.6 Gaussian Random Variable and Q-Function								
	3.7 Other Important Random Variables								
	3.8 Conditional Distribution and Density Function								
	Chapter 4: **EXPECTATION**	CL O3	5hr	5 hr			3hr	7hr	20hr
	4.1 Moments and Variance								

	4.2Expectation of a Function of Random Variable								
	4.3 Characteristic Function								
	4.4 Expectation of a Function of Two Random Variables								
	4.5 Sum of Mutually Independent Random Variables								
	4.6 Central Limit Theorem								
	4.7 Transformation of Random Variables: Monotonically Increasing Functions, Monotonically decreasing Functions, and Non monotonic Functions								
	Chapter 5: **RANDOM PROCESSES**	CL O5	4hr	4 hr			3hr	9hr	20hr
	5.1 Random Process and Ensembles								
	5.2 Autocorrelation Functions								
	5.3 Cross-Correlation Functions								
	5.4 Stationary Random Processes								
	5.5 Ergodic Random Processes								
	5.6 Properties of Autocorrelation Function								
	5.7 Properties of Cross Correlation Function								
	5.8 Power Spectral Density Function								
	Chapter 6: **ESTIMATION THEORY**	CL O4	2hr	2 hr			1hr	2hr	7hr
	6.1 Criteria of Estimators								
	6.2 Estimation of Random Variables								
	6.3 Estimation of								

	parameter								
	Total								98hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5%	√		1hr
	2	Test	10%	√		2hr
	3	Assignment I	5%		√	6hr
	4	Assignment II	10%	√		8hr
	5	Mid exam	20%		√	2hr
	Total					19hr
	Final Exam		Percentage 50(%)	F2F	NF2F	SLT
	Final Exam		50	√		3hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	MATLAB Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Donald G. Childers: **probability and random processes** using MATLAB with applications to continuous and discrete time systems-Richard D. Irwin(1997)
		2	Miller, Scott L., Childers, Donald: **Probability and Random Processes**, with application to signal processing & communication, Oct, 2004
		3	Albert Leon-Garcia ,"**Probability and Random Processes** for Electrical Engineering", 2/E Publisher: Prentice Hall, 1994
		4	Karalov, Leonid B., Sinai, Yakov G: **Theory of probability and random processes** Springer, 2nd ed., (2007)
		5	Venkatarama_Krishnan-Probability_and_random_processes-Wiley-Interscience(2006)

Adama Science and Technology University			
1	College: CoEEC		Department: ECE
2	Course Category	Major Mandatory	
	Course Name	Digital Signal Processing	
	Course Code:	ECEg3205	

3	Synopsis:	Introducing the development of analytical representation and design of discrete time signals and systems. Discussing the Analysis of discrete time signals and systems in time domain and transform domains. ADC and DAC, Sampling theorem, Sampling Rate conversion, Aliasing, LTI signals and systems, Discrete time Fourier Transform, Fast Fourier Transform, Z-transform, and analysis and design of digital filters.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year :	III	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	ECEg2204-Signals and Systems Analysis				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					

	CLO1	Discuss about fundamentals of signal processing and applications of digital signal Processing.
	CLO2	Characterize discrete time signals representations in time domain
	CLO3	Analyze discrete time signals and discrete-time systems in transform domains
	CLO4	Interpret digital signal processing in time domain and in frequency domains
	CLO5	Design applications based on digital signal processing: transfer functions and digital filters

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)											Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7					L	T	P	O	Quiz	Test	Assignment	Mid Exam	Final Exam
CLO1	√											√	√	√					√	√
CLO2	√											√	√	√		√		√	√	√
CLO3	√											√	√	√			√	√	√	√
CLO4		√										√	√				√	√		√
CLO5	√											√	√					√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB software
	2	Octave software
	3	
11	Distribution of Student Learning Time (SLT)	

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning(NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Signals and Signal Processing**	CLO1	1hr				1hr	1hr	3hr
1.4 Characterization and Classification of Signals								
1.5 Typical Signal Processing Operations								
1.6 Signals and Signal Processing Applications								
Chapter 2: **Sampling of Continuous Time Signals**	CLO2	4hr	3hr	3hr		4hr	6hr	20hr
2.1 Introduction								
2.2 Periodic Sampling								
2.3 Frequency -Domain Representation of Sampling								
2.4 Reconstruction of Bandlimited Signals from ItsSamples								
2.5 Changing the SamplingRate Using Discrete-Time Processing								
2.6 Digital Processing of Analog Signals								
2.7 Analog to Digital Conversion								
2.8 Digital to Analog Conversion								
Chapter 3: **Discrete-Time Signals and Systems in Time-Domain**	CLO3	3hr	3hr	2hr		4hr	4hr	16hr
3.1 Discrete-time Signals								
3.2 Discrete-Time Systems								
3.3 LTI Discrete-Time Systems								
3.4 Properties of LTI Discrete-Time Systems								

3.5 Linear Constant Coefficient Difference Equations								
3.6 Correlation of Signals								
Chapter 4: **Discrete-Time Signals in Transform Domains**	CLO4	6hr	4hr	3hr		3hr	8hr	24hr
4.1 Discrete-time Fourier Series								
4.2 Discrete-time Fourier Transform								
4.3 Discrete Fourier Transform								
4.4 Fast Fourier Transform								
4.5 Z-Transform								
Chapter 5: **LTI Discrete-Time Systems inthe Transform-Domains**	CLO4	3hr	2hr	2hr		3hr	6hr	16hr
5.1 The Frequency Response of LTI Systems								
5.2 The Transfer Functions								
5.3 Types of Transfer Functions								
5.4 Relationship Between Magnitude and Phase								
Chapter 6: **Digital Filter Design**	CLO5	5hr	3hr	3hr		4hr	6hr	21hr
6.1 Introduction								
6.2 Characteristics of Practical Frequency Selective Filters								
6.3 Design of discrete-time IIR Filters from Analog Filters								
6.4 Design of FIR digital Filters								
Total								100hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5		√	1hr
2	Test	10		√	4hr
3	Assignment	15		√	10hr

	4	Mid Test	20	√		2hr
	Total					20hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50%	√		3hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to FaceNote: indicates the CLO based on the CLO's numbering in item 9.					

12		1	MATLAB Software
	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	2	Computer lab
		3	Software
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Oppenheim, Schafer: Discrete-Time Signal Processing. Prentice Hall, 3rd edition, August 2009.
		2	J.G. Proakis, D.G. Manolakis: Digital Signal Processing – Principles,Algorithms and Applications. Prentice Hall, 1996. Newer editions may beavailable
		3	M. Hayes: Schaums Outline of Digital Signal Processing, McGraw-Hill,second edition, September 2011
		4	J. G. Proakis and V. K. Ingle: Digital Signal Processing with MATLAB,Pearson Education, Inc., Upper Saddle River, NJ, 2007.

Adama Science and Technology University		
1	School: Humanities and Social Science	Department: Humanities Unit
2	Course Category	**General Course**
	Course Name	**General Psychology and Life skills**
	Course Code:	**LART 2002**
3	Synopsis:	Psychology is a science of human cognitive processes and behaviors. This course is designed to give students an overview of what psychological science has discovered about human behavior and mental processes throughout human history. Students will gain an understanding of the psychological phenomena that occur in daily life as well as the practical applications of psychological knowledge. Upon completing the course, students shall be able to demonstrate a basic knowledge of the science of psychology. Specifically, the course general psychology is concerned with discussing perspectives in psychology and basic psychological concepts such as sensation and perception,

		learning, personality, motivation, emotion, and basic life skills (intrapersonal, interpersonal, social and academic skills). Emphasis will be given to both theoretical and practical implications of these concepts to effectively function as individual and team in a community.
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: One; Year: One
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	None

8 Course Learning Outcome (CLO): At the end of the course the student will be able to do:

CLO-1	Describe basic psychological concepts
CLO-2	Compare and contrast the major theoretical perspectives in psychology
CLO-3	Examine major concepts in psychology: personality; sensation and perception; learning, memory and forgetting.
CLO-4	Summarize motivational and emotional processes.
CLO-5	Demonstrate basic life skills (intrapersonal, interpersonal, social and academic skills) in everyday life.
CLO-6	Apply knowledge of psychology in their life.

9 Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Students Outcome (SO)														
							Teaching Methods				Assessment				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO-1						√	√			√	√				
CLO-2						√	√			√	√				
CLO-3					√		√			√	√				
CLO-4							√			√			√		
CLO-5						√	√		√	√			√		
CLO-6						√	√			√					

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Research skills
2	Understanding human behavior, social skills and communication skills
3…etc.	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
		Guided learning (F2F)	Guided Learning	Independent Learning	

							(NF2F)	(NF2F)	
			L	T	P	O			
	Chapter 1: ESSENCE OF PSYCHOLOGY 1.1 Definition of Psychology and Related Concept	CLO-1	1hr			1hr		2hrs	4hrs
	1.2 Goals of Psychology		1hr					2hrs	3hr
	1.3 Historical Background and Major Perspectives in Psychology		1hr					2hrs	3hr
	Chapter 2: SENSATION AND PERCEPTION 2.1 The meanings of sensation and perception	CLO-3	1hr					2hrs	3hrs
	1.2.The sensory lows: Sensory threshold and sensory adaptation		1hr					4hrs	5hrs
	1.3.Perception		1hr					2hrs	3hrs
	Chapter 3: LEARNING AND THEORIES OF LEARNING 3.1 Definition, Characteristics and Principles of Learning	CLO-2	1hr			1hr		4hrs	6hrs
	3.2 Factors Influencing Learning		1hr					2hrs	3hrs
	3.3 Theories of Learning and their Applications		2hrs			4hrs		6hrs	12hrs
	Chapter 4: MEMORY AND FORGETTING 4.1 Memory	CLO-3	1hr			1hr		2hrs	4hrs
	4.2 Forgetting		1hr					1hr	2hrs
	4.3 Improving Memory		1hr					2hrs	3hrs
	Chapter 5: MOTIVATION AND EMOTIONS 5.1 Motivation	CLO-4	1hr					1hr	2hrs
	5.2 Definition and types of motivation		1hr			1hr		2hrs	4hrs
	5.3 Approaches to motivation (theories of motivation)		2hrs			1hr		6hrs	9hrs
	5.4 Conflict of motives and		1h					2hrs	3hrs

	frustration 5.5 Emotions		r						
	5.6 Theories of emotion		2hrs			1hr		5hrs	8hrs
	Chapter 6: PERSONALITY 6.1. Meaning of Personality	CLO-3	1hr					1hr	2hrs
	6.2. Theories of Personality		2hrs			1hr		5hrs	8hrs
	Chapter 7: LIFE SKILLS 7.1 Basic Concepts of Life-skills	CLO-5	2hrs			1hr		3hrs	6hrs
	7.2 Intra-Personal and Interpersonal Skills		1hr					3hrs	4hrs
	7.3 Academic Skills		1hr					4hrs	5hrs
	7.4 Social Skills							3hrs	3hrs
	Total		**26** hrs			**13** hrs		**66** hrs	**105** hrs

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Assignments (2)	10%		√	10hrs
	2	Test 1	10%	√		1hr
	3	Test 2	10%	√		1hr
	4	Mid Exam	20%	√		1hr
	5					
					Total	13hrs
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50%	√		2hrs
					Grand Total SLT	120hrs
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Well-furnished classroom
		2	Laptop
		3	LCD
		4	Whiteboard
		5	Whiteboard marker
13	Text book and reference: (note: ensure the latest edition /publication)	1	G l e i t m a n, H., G r o s s, J . and R e i s b e r g, D. (2011). Psychology.(8th ed.). New York: W • W • NORTON & COMPANY
		2	Kearns, T. and Lee, D. (2016).General Psychology: An Introduction. IL: DEF Publishers. DOI: nobaproject.com
		3	Guthrie, R. V. (2003). Even the rat was white: A historical view of psychology

			(2nd ed.). Boston: Allyn & Bacon.
		4	Halpern, D. F. (2002). Thought and knowledge: An introduction to critical thinking (4th ed.) Hillsdale, NJ: Erlbaum.
		5	Hock, R. R. (2002). Forty studies that changed psychology: Explorations into the history of psychological research. Upper Saddle River, NJ: Prentice Hall.

Adama Science and Technology University						
1	College: Applied Natural Science		Department: Applied Physics			
2	Course Category	Major mandatory				
	Course Name	Applied Modern Physics				
	Course Code:	Phys2208				
3	Synopsis:	The rationale of this course is to introduce students to the basic ideas of modern physics with emphasis on the Theory of Special Relativity, identification of the limitations of classical mechanics and the development of quantum mechanics, the wave particle duality, the atomic structure and nuclear transformation				
4	Name(s) of Academic Staff:	Mr.Abdi D, Dr. Tewodros Yirgashewa, Mr.Samuel B, Mr.Fitsum A				
5	Semester and Year offered:	Semester:	II	Year:	2	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	General Physics				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Apply the basic principles of the Special Theory of Relativity and its mathematical methods to show some effect of theory of relativity in modern Physics such as Doppler Effect, time dilation, length contraction, relativity of mass and energy				
	CLO2	Compare and contrast the Galilean and Lorenz transformations by formulating equations.				
	CLO3	Analyze the limitation of classical mechanics that leads to the development of quantum mechanics.				
	CLO4	Differentiate particle properties of wave and wave properties of particles by using different physical phenomena such as Photoelectric Effect, Compton Effect/Scattering, X-ray diffraction, Black Body Radiation, Particle Diffraction etc…				
	CLO5	Analyze atomic structure and atomic spectra using different model such as Thomson, Rutherford, and Bohr Atomic Models				
	CLO6	Understand the principal aspects of radio activity				

9 Mapping of the course Learning Outcomes to the student Learning Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)															
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√							√	√			√		√		
CLO2		√						√	√			√	√			
CLO3							√	√	√			√		√		
CLO4				√				√	√					√		
CLO5					√			√	√				√	√		
CLO6								√	√							

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	develop the knowledge and skills required to perform simple relativistic calculations and to appreciate their consequences

11 Distribution of Student Learning Time (SLT)

Course Content Outline	**CLO**	**Teaching and Learning Activities**						**Total (SLT)**
		Guided learning (F2F)				**Guided Learning (NF2F)**	**Independent Learning (NF2F)**	
		L	**T**	**P**	**O**			
Chapter 1: Special Theory of Relativity		**15**	**5**				**23**	**43**
1.1 Relativity of Orientation and Origin	1	3	1				1	8
1.2 Inertial and Non inertial Reference Frames	1						1	
1.3. Galilean Transformation	1						2	
1.4. Michelson Morley Experiment	1, 2	3	1				2	9
1.5. Postulates of Special Relativity	1						1	

	1.6. Lorenz Transformation	2							2	
	1.7. Applications of the Lorentz Transformation	2	3	1					2	9
	1.8. Velocity - Addition Formula	1, 2							1	
	1.9. Doppler Effect	1, 2							2	
	1.10. Time Dilation	1, 2	3	1					1	9
	1.11. Length Contraction	1, 2							2	
	1.12. Relativity of Mass	1, 2							2	
	1.13. Relativistic Momentum	1, 2	3	1					2	8
	1.14. Relativistic Mass and Energy	1, 2							2	
	Chapter 2: Development of Quantum Mechanics		**3**	**1**					**6**	**6**
	2.1 Limitations of Classical Physics	3	3	1						6
	2.2. Development of Quantum Mechanics	3							1	
	2.3. Uniqueness and role of Quantum Mechanics	3							1	
	Chapter 3: Particle Properties of Waves		**9**	**3**					**14**	**22**
	3.1 Wave Particle Dualism	4	3	1					2	8
	3.2 Photoelectric Effect	4							2	
	3.3. Quantum Theory of Light	4	3	1					2	8
	3.4 . Compton Effect/Scattering	4							2	
	3.5. X-ray diffraction and Bragg's law	4	3	1					1	6

	1.4 3.6. Black Body Radiation	4						1	
	3.7. Derivation of Plank's Distribution Law	4						1	
	Chapter 4: Wave Properties of Particles	**4**	**9**	**3**				**14**	**22**
	4.1. De Broglie waves		3	1				1	7
	4.2. Wave function and its Interpretation	4						2	
	4.3. De Broglie wave velocity	4	3	1				2	7
	4.4. Phase and Group velocities	4						1	
	4.5. Particle Diffraction	4	3	1				2	8
	4.6. Uncertainty Principle and its Application	4						1	
	4.7. Gedanken Experiment	4						1	
	Chapter 5: Atomic Structure		**9**	**3**				**10**	**22**
	5.1Atomic Models (Thomson	5	3	1				1	8
	5.2. Scattering Cross Section	5						1	
	5.3. Alpha Particle Scattering	5						2	
	5.4. Rutherford Scattering Formula	5	3	1				2	9
	5.5. Electron Orbits	5						2	
	5.6. Atomic Spectra	5						1	
	5.7. Bohr Atom his Explanation of Atomic Spectra	5	3	1				2	9
	5.8. Quantization of Atomic Energy Levels	5						2	
	5.9. Atomic Excitations	5						1	
	Chapter 6: - Nuclear Transformation		9						
	6.1. Radioactive Decay, 6.2. Half Life,								

	6.3. Radioactive Series, Alpha Decay, Beta Decay &Gamma decay, 6.4. Nuclear cross sections, 6.5. Nuclear reactions								
	Total		45	15				55	115 hrs

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5 %	√		15 min
2	Test	10 %	√		30min
3	Assignments	15 %		√	1 hrs
4	Mid exam	20 %	√		30 min
Total					2.25 hrs
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50 %			3 hrs
Grand Total SLT					**120 hrs**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		LCD Projector and white board
13	Text book and reference: (Note: ensure the	1	Arthur Beiser, Concepts of Modern Physics, 6th ed., (2002).
		2	Raymond A. Serway, Physics: For Scientists & Engineers, 6th ed., Thomson Bruke, (2004).
		3	Hugh D. Young and Roger A. Freedmann, University Physics with Modern

	latest edition /publication)		Physics 12th ed., (2008).
		4	Douglas C. Giancoli, Physics for scientists and engineers, Printice Hall, 4th (2005).
		5	Robert Resnick and David Halliday, Fundamentals of Physics Extended, HRW 8th ed., (2008).

Adama Science and Technology University		
1	**College:** CoEEC	**Department:** ECE
2	**Course Category**	Major Mandatory
	Course Name	**Introduction to Communication Systems**
	Course Code:	ECEg-3202
3	**Synopsis:**	This course introduces about basic of an analog communication system, analysis of AM and angle modulation signals in time and frequency domain, modulation and demodulation technique of linear AM, DSB, SSB, VSB signal and nonlinearmodulation techniques such as PM and FM, various types of noises and its mathematical representation, Effect of noise on AM and FM receiver and comparative performance of between AM and FM system.
4	**Name(s) of Academic Staff:**	
5	**Semester and Year offered:**	Semester: II Year: III
6	**Credit Hour:**	4
7	**Prerequisite/ Co-requisite: (if any)**	ECEg2202: Electronics Circuit II
8	**Course Learning Outcome (CLO):** At the end of the course the student will be able to do:	
	CLO1	Apply the basic concept of signals as well as modulation in communication systems.
	CLO2	Analyze and compare different AM modulation schemes for their efficiency andBandwidth.
	CLO3	Analyze angle modulation schemes and design Rx as well as Tx for communicationsystems.
	CLO4	Understand the characteristics and mathematical representation of noise
	CLO5	Analyze the behavior of various types of AM receivers in the presence of noise.
	CLO6	Analyze the behavior of FM receiver and P&DE in the presence of noise.
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methodsand Assessment:	

Course Learning Outcomes (CLO)	Student Outcomes (SO)							TeachingMethods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Lab	Quiz	Assign	Mid	Final Exam
CLO1	√	√				√		√	√	√					√	√
CLO2	√	√				√		√	√	√		√		√	√	√
CLO3	√	√		√		√		√	√	√		√	√	√	√	√
CLO4	√	√				√		√	√			√		√		√
CLO5	√	√				√	√	√	√			√		√		√
CLO6	√	√				√	√	√	√			√				√

Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)
1	MATLAB and LabVIEW softwares
2	Communication Lab Modules
3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total(SLT)
		Guided learning(F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Introduction	CLO1	2 hr	2 hr	2 hr		3hr	6hr	15hr
1.1 Review of signals and systems								
1.2 Frequency domain representation of signals								
1.3Overviewof Communicationsystem								
1.4 Communication channels								
1.5 Need for modulation								
1.6 Types of modulation								
1.7 High level modulation and low level modulation								
1.8 Baseband and Passband signals								
Chapter 2: Amplitude Modulation	CLO2	6 h	3 hr	4 hr		5hr	6hr	24hr

	(AM)		r						
	2.1 Time and Frequency domain representation of AM signal.								
	2.2 Double side band with Carrier (DSB-C), Double side band suppressed Carrier (DSB-SC) modulation and demodulation techniques.								
	2.3 Single Side Band (SSB), Vestigial Side Band (VSB), and Quadrature Amplitude modulation and demodulation techniques.								
	2.4 Overview of Frequency Division Multiplexing (FDM)								
	Chapter 3: **Angle Modulation**	CLO3	6hr	3 hr	4 hr		5hr	6hr	24hr
	3.1 Time and Frequency domainrepresentation of Angle Modulation (FM & PM) signal								
	3.2 FM and PM modulation anddemodulation techniques								
	3.3 Narrow band and Wide bandAngle modulation								
	3.4Stereophonic FM Broadcasting								
	3.5 Radio Receiver (Tuned Radio Frequency and Super heterodyne Receiver)								
	Chapter 4: **NOISE**	CLO4	6hr	3 hr	4 hr		5hr	6hr	24hr
	4.1 Overview of random process								
	4.2 Sources of Noises								
	4.3 Frequency domain representation of Noise								
	4.4 Gaussian and white noisecharacteristics								
	4.5 Super position of Noises,Linear filtering of Noises								
	4.6Mathematical Representation of Noise.								
	4.7 Signal to Noise Ratio, Figure of Merit								

	4.8 Equivalent Noise resistance of Amplifier and temperature of system							
	Chapter 5: **NOISE IN AMPLITUDE MODULATION SYSTEMS**	CLO5	2 hr	2 hr	2 hr		3hr	6hr	15hr
	5.1 Noisy Receiver Model								
	5.2 Noise in AM DSB-FC Receivers								
	5.3 Threshold Effect								
	5.4 Noise in AM DSB-SC Receivers								
	5.5 Noise performance of AMreceivers								
	Chapter 6: **NOISE IN FREQUENCY MODULATION SYSTEMS**	CLO6	1 hr	2 hr	2 hr		2hr	3hr	10hr
	6.1 FM Receiver Model								
	6.2 Noise in FM Receiver								
	6.3 Pre-emphasis and De-emphasis in FM Systems								
	6.4 FM Threshold Effect								
	Total								117 hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz 1	5	√		1 hr
	2	Lab	15	√	√	28hr
	3	Assignment	10		√	8 hr
	4	Mid Test	20	√		3 hr
	Total					40 **hr**
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			√		**3hr**
	Grand Total SLT					**160** Hrs.
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to FaceNote: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliverthe course (e.g. software, computer lab, simulation room ...etc.)	1	MATLAB Software
		2	Computer lab
		3	LabVIEW Software
		4	Choose an item.
		5	Choose an item.

13	Textbook and reference: (note: ensure the latest edition /publication)	Tex.	] Communication Systems, 4th Edition, Simon Haykins, Wiley, 2006.] Modern Digital and Analog Communication Systems, 4th edition, B P Lathi, Oxford University Press, 2010.] Digital Communications, John G Proakis, Tata McGraw Hill Publications.
		Ref.	[1]. Principles of Communication Systems, Taub and Schilling, McGraw Hill Publication, 2008. [2] Analog and Digital communication system, Dr. Sanjay Sharma, 2015

<table>
<tr><td colspan="7">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="2">College: Applied Science</td><td colspan="4">Department: Physics</td></tr>
<tr><td>2</td><td>Course Category</td><td colspan="5">Basic Mandatory</td></tr>
<tr><td></td><td>Course Name</td><td colspan="5">Solid State Physics</td></tr>
<tr><td></td><td>Course Code:</td><td colspan="5">Phys3202</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">This course is intended to introduce students to the basic ideas that underlie solid state physics, with emphasis on the behavior of electrons in crystalline structures, particularly in materials that are metallic. The other contents are X-ray diffraction, Binding Energy in Crystals, Thermal properties of solids, Dielectric properties of solid, Magnetic properties of solids, The free electron Fermi gas.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5">Dr. Solomon Tiruneh, Dr. T. Gurumurthi, Fekadu Tolessa</td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester :</td><td>I</td><td>Year:</td><td>3</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">3</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">Phys2208</td></tr>
<tr><td>8</td><td colspan="6">Course Learning Outcome (CLO): At the end of the course the student will be able to:</td></tr>
<tr><td></td><td>CLO1</td><td colspan="5">describe crystal structure of solids in terms of a space lattice + unit cell, and relate structures in real space to those in reciprocal space</td></tr>
<tr><td></td><td>CLO2</td><td colspan="5">elaborate how the diffraction of X rays are related to the properties of the reciprocal lattice, explain the concepts of the reciprocal lattice and the Brillouin zone</td></tr>
<tr><td></td><td>CLO3</td><td colspan="5">describe the various atomic bonds, properties of metallic crystals and cohesive energy.</td></tr>
<tr><td></td><td>CLO4</td><td colspan="5">apply knowledge of how crystalline structures vibrate and the associated theories of heat capacity</td></tr>
<tr><td></td><td>CLO5</td><td colspan="5">be familiar with and understand the magnetic and dielectric properties of solids for practical applications</td></tr>
<tr><td></td><td>CLO6</td><td colspan="5">discuss about the free electron’s gas, electrical, thermal and optical properties in terms of the free electron model</td></tr>
<tr><td>9</td><td colspan="6">Mapping of the course Learning Outcomes to the Student Learning Outcomes, Teaching Methods and Assessment:</td></tr>
</table>

9	Course Learning Outcomes (CLO)	Student Outcomes (SO)															
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
	CLO1	√	-	-	-	-	-	-	√	√	-	-		√		-	-
	CLO2	-	√	-	-	-	-	-	√	√	-	-		√		-	-
	CLO3	-	-	√	-	-	-		√	√	-	-			√	-	-
	CLO4	-	-	-	√	-	-		√	√	-	-	√		√	-	-
	CLO5	-	-	-	-	√	-		√	√	-	-	√		√	-	-
	CLO6	-	-	-	-	-	-	√	√	√	-	-			√	-	-
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)
	1. Students will have the interest in developing local technologies and adapting technologies for local needs. 2. Students can able to solve problems related to interdisciplinary fields

9	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Crystal Physics		**6**	**2**	**-**	**-**		**5**	**13**
	1.1 Introduction- atomic models	1	3	1	-	-		1	7
	1.2 Lattice points and space lattice	1			-	-		1	
	1.3 Fundamental types of lattices	1			-	-		1	
	1.4 Index system for crystal planes	1	3	1	-	-		1	6
	1.5 Classification of crystals	1				-		1	
	Chapter 2: X-ray diffraction		**4**	**2**	**-**	**-**		**5**	**11**
	2.1 Reciprocal lattices	2	3	1	-	-		1	7
	2.2 Diffraction of waves by crystals: Bragg's law	2			-	-		2	
	2.3 Brillouin zones in one and two dimensions	2	1	1	-	-		2	4

	Chapter 3: Binding Energy in Crystals		**5**	**2**	**-**	**-**		**6**	**13**
	3.1 Bonding in solids	3	2	1	-	-		1	5
	3.2 Ionic bonding	3			-	-		1	
	3.3 Covalent bonding	3	3	1	-	-		2	8
	3.4 Metallic bond	3			-	-		1	
	3.5 Properties of metallic crystals and Calculation of cohesive energy	3			-	-		1	
	Chapter 4: Thermal properties of solids		**7**	**3**	**-**	**-**		**8**	**18**
	4.1 Crystal vibrations	4	3	1	-	-		2	8
	4.2 Explanation about the Lattice specific heat	4			-	-		1	
	4.3 Dulong and Petit law derivation with explanation based on Classical theory	4			-	-		1	
	4.4 Einstein's theory of specific heat	4	4	2	-	-		2	10
	4.5 Debyes theory	4			-	-		1	
	4.6 Explanation about the thermal conductivity	4			-	-		1	
	Chapter 5: Dielectric properties of solid		**9**	**3**	**-**	**-**		**10**	**21**
	5.1 Review of basic formulae	5	3	1	-	-		1	6
	5.2 The microscopic concept of polarization	5			-	-		1	
	5.3 Langevin's theory of po- larization in polar dielectrics	5	3	1	-	-		-	8
	5.4 Clausius-mosotti relation	5			-	-		2	
	5.5The static dielectric constant of solids and liquids (Elemental dielectrics, Polarization of ionic crystals)	5			-	-		2	
	5.6 Ferroelectricity	5	3	1	-	-		2	7
	5.7 Piezoelectricity	5			-	-		1	
	Chapter 6: Magnetic properties of solids		**8**	**4**	**-**	**-**		**8**	**20**
	6.1 Magnetic permeability	5	3	1	-	-		-	6
	6.2 Magnetization	5			-	-		-	

	6.3 Diamagnetism	5			-	-		2	
	6.4 Paramagnetism	5	2	1	-	-		2	6
	6.5 Ferromagnetism	5			-	-		1	
	6.6 Quantum theory of paramagnetism and ferromagnetism	5	3	2	-	-		2	8
	6.7 The domain model	5			-	-		1	
	Chapter 7: The free electron Fermi gas		**6**	**2**	**-**	**-**		**6**	**14**
	7.1 Energy levels in one dimension	6	3	1	-	-		2	7
	7.2 Effect of temperature on the Fermi-dirac distribution	6			-	-		1	
	7.3 Free electron gas in three dimensions	6	3	1	-	-		2	7
	7.4 Heat capacity of the electron gas	6			-	-		1	
	Total		**45**	**18**	**-**	**-**		**48**	**111**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz 1	5	√	-	30 min.
2	Quiz 2	5	√	-	30 min.
3	Assignment 1	5	-	√	1.5 hrs.
4	Assignment 2	5	-	√	1.5 hrs.
5	Mid Test	30	√	-	2 hrs.
Total					**6 hrs.**
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√	-	3 hrs.
				Grand Total SLT	**120 hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Power Point Projector
13	Text book and reference: (Note: ensure the	1	Introduction to Solid State Physics by Charles Kittel, Wiley and Sons, 8th Edition. (Text Book)
		2	Solid State Physics by S.O. Pillai (Reference Book)

	latest edition /publication)	3	Elements of Solid-State Physics by J.P. Srivastava (Reference Book)

<table>
<tr><td colspan="16">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="5">School:</td><td colspan="10">Department:</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">Course Category</td><td colspan="3">General Course</td><td colspan="10"></td></tr>
<tr><td colspan="2">Course Name</td><td colspan="13">History of Ethiopia and the Horn</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="13">LART 1003</td></tr>
<tr><td>3</td><td colspan="2">Synopsis:</td><td colspan="13">This course describes why history is important, how history is studied and introduces the region Ethiopia and the Horn. It treats human evolution, Neolithic Revolution, settlement patterns as well as religion and religious processes in Ethiopia and the Horn. Based on these historical backgrounds, the course describes states, external contacts, economic formations and achievement in terms of architecture, writing, calendar, and others to the end of the 13th century. Historical processes including states formation and power rivalry, trade, external relation, threats and major battles, centralization and modernization attempts, Italian occupation, and socio-economic conditions from 1800 to 1941 makes central position in the modern history of the region.</td></tr>
<tr><td>4</td><td colspan="2">Name(s) of Academic Staff:</td><td colspan="13"></td></tr>
<tr><td>5</td><td colspan="2">Semester and Year offered:</td><td colspan="3">Semester:</td><td colspan="2">II</td><td>Year:</td><td colspan="3">3</td><td colspan="4"></td></tr>
<tr><td>6</td><td colspan="2">Credit Hour:</td><td colspan="13">3</td></tr>
<tr><td>7</td><td colspan="2">Prerequisite/ Co-requisite: (if any)</td><td colspan="13">None</td></tr>
<tr><td rowspan="6">8</td><td colspan="15">Course Learning Outcome (CLO): At the end of the course the student will be able to do:</td></tr>
<tr><td>CLO-1</td><td colspan="14">Identify the nature of history and criticize sources</td></tr>
<tr><td>CLO-2</td><td colspan="14">Identify pertinent sources for the history of the peoples of Ethiopia and the Horn</td></tr>
<tr><td>CLO-3</td><td colspan="14">Describe changes and continuities in Ethiopia and the Horn .</td></tr>
<tr><td>CLO-4</td><td colspan="14">Discuss the causes, courses and consequences of events that happened in the region</td></tr>
<tr><td>CLO-5</td><td colspan="14">Explain the nature of the region’s external contacts and their effects</td></tr>
<tr><td></td><td>CLO 6</td><td colspan="14">Appreciate peoples‟ achievements, heritages and cultural diversities of the region</td></tr>
<tr><td rowspan="4">9</td><td colspan="15">Mapping of the course Learning Outcomes to the Students Outcome, Teaching Methods and Assessment:</td></tr>
<tr><td rowspan="3">Course Learning Outcomes</td><td colspan="14">Students Outcome (SO)</td></tr>
<tr><td rowspan="2">SO-1</td><td rowspan="2">SO-2</td><td rowspan="2">SO-3</td><td rowspan="2">SO-4</td><td rowspan="2">SO-5</td><td rowspan="2">SO-6</td><td rowspan="2">Teaching Methods</td><td colspan="5">Assessment</td></tr>
<tr><td>Test</td><td>Quiz</td><td>Assignm</td><td>Project</td><td>Lab-report</td></tr>
</table>

								L	T	P	O					
	CLO-1															
	CLO-2															
	CLO-3															
	CLO-4															
	CLO-5															
	CLO 6															
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box															

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Develop a kill of critical analysis of sources
	2	Demonstrate a skill of substantiation of arguments .
	3	Document a sources .

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: 1.1. The Nature and Uses of History	1	4	4				8	16
1.2 Sources and Methods of Historical Study								
1.3. The History of Historical Writing in Ethiopia and the Horn								
1.4. The Geographical Context of Human History in Ethiopia and the Horn0								
Chapter 2: Peoples and Cultures in Ethiopia and the Horn 2.1. Human Evolution	2	3	3				6	12
2.2. Neolithic Revolution								
2.3. The Peopling of the Region								
2.4. Religion and Religious Process								
Chapter 3: Polities, Economy and Socio-Cultural Processes in Ethiopia and the Horn to the End of the 13th Century 3.1. Evolution of State	3	4	4				8	16
3.2 Ancient Polities								

	3.3. External Contacts								
	3.4. Economic Formation								
	3.5. Socio-cultural Achievement								
	Chapter 4: Politics, Economy and Socio-Cultural Processes from the Late Thirteenth to the beginning of the Sixteenth Centuries 4.1 The “Restoration” of the “Solomonic’’ Dynasty	4	3	4				7	14
	4.2. Power Struggle, Consolidation, Territorial and Religious Expansion of the Christian Kingdom								
	4.3. Political and Socio-Economic Dynamics of Muslim Sultanates								
	4.4. Rivalry between the Christian Kingdom and the Muslim Sultanates								
	4.5. External Relations	5							
	Chapter 5: Politics, Economy and Socio-Cultural Processes from Early Sixteenth to the End of the Eighteenth Centuries		5	5				10	20
	5.1. Interaction and Conflicts between the Christian Kingdom and the Sultanate of Adal	6							
	5.2. Foreign Interventions and Religious Controversies								
	5.3. Population Movements								
	5.4. Interaction and Integration across Ethnic and Religious Diversities								
	5.5. Peoples and States in Eastern, Central, Southern and Western Region	4							
	5.6. The Period of Gondar (1636-1769) and Zemene-Mesafint / Era of the Princes (1769-1855)								
	Chapter 6. Internal Interactions and External Relations in Ethiopia and the		5	5				10	20

	Horn, 1800-1941								
	6.1. The Nature of Interactions among Peoples and States of Ethiopia and the Horn	4							
	6.2. Power Rivalry								
	6.3. The Making of Modern Ethiopian State								
	6.4. Modernization Attempts	4							
	6.5. Socio-Economic Issues/Developments								
	6.6. Socio-Economic Issues/Developments	5							
	Chapter. 7. Internal Developments and External Relations, 1941–1994		3	2				5	10
	7.1. Post-1941 Imperial Period	5							
	7.2. The Derg Regime (1974-1991)	6							
	Total		27	27				54	108

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	15%	1		1
2	Assignments	10%	1		1
3	Tests	10%	2		2
4	Assignments	10%	1		1
5	Quize	5%	1		1
				Total	12

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50%	2	4	6
			Grand Total SLT	120

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.
		2	Choose an item.
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book		Ministry of Science and Higher Education History of Ethiopia and the Horn

			Module.

Adama Science and Technology University						
1	College: CoEEC			Department: ECE		
2	Course Category	Major Elective				
	Course Name	Microelectronic devices & circuits				
	Course Code:	ECEg-3306				
3	Synopsis:	In this course, in first two chapters the topics to be covered include review of Semiconductor devices, analysis of BJT as an amplifier and switch , Small signal model of BJT, MOSFET operation and MOS spice model. Further in chapter III the basics of CMOS, CMOS invertor, Implementation of circuits using CMOS invertor and CMOS based amplifiers and differential pair have to be discussed. the operational amplifier and advanced filters including Butterworth filter have to be discussed in chapter 4. The last chapter includes the topic of ADC and DAC and their performance matrices				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	III	
6	Credit Hour:	3(2/0/3) (lec/tut/lab)				
7	Prerequisite	Electronic Circuit-II (ECEg2202)				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Explain the basic concepts realization of microelectronic devices and circuits;				
	CLO2	Explain the analysis of BJT and MOS in context with microelectronics devices to circuits				
	CLO3	Implementation of Digital and analog circuits using CMOS based circuits				
	CLO4	Analyze and design op-amp based circuits and advanced filters				
	CLO5	Learn and design the analog to digital convertor and vice versa.				
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:					
	Course Learning Outcomes	Student Outcomes (SO)				

	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Lab	Quiz	Assignment	Mid Exam	Final Exam
CLO1	√							√	√	√		√	√	√	√	√
CLO2		√						√	√	√		√	√	√	√	√
CLO3			√	√				√	√	√		√		√		√
CLO4		√		√	√			√	√	√		√		√		√

The relevancy between the CLO and SO is indicated by "√"on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)
1	SPICE software
2	MATLAB (Simulink)
3	Any modern microelectronic devices and circuits design and simulation tools

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter one Introduction to Microelectronics	CLO1	4hr	-	-	-	1hr	5hr	10hr
1.1 Overview of microelectronics and its significance								
1.2 Review of semiconductor fundamentals								
1.3 Charge carriers, doping, and energy bands								

	1.4 p-n junctions, diode behavior and band diagram								
	Chapter Two: **Transistors Analysis**	CLO2	6hr	-	3hr	-	2hr	6hr	17hr
	2.1 BJT operation, characteristics, and biasing								
	2.2 Small-signal models and linear applications								
	2.3 BJT as a switch and Ebers Moll Model								
	2.4 MOSFET operation and characteristics								
	2.5 MOS Parasitic & SPICE Model								
	2.6 Current Mirror								
	Chapter Three: **CMOS Circuits**	CLO2, CLO3	6hr	-	3hr		3hr	8hr	20hr
	3.1 CMOS Inverter Basics								
	3.2 Logic gates and basic combinational circuits using CMOS								
	3.3 Biasing of MOS Amplifier								
	3.4 CMOS Common Source/Common Gate /Source Follower- Amplifier Configuration								
	3.5 MOS Differential Amplifier								
	3.6 MOS Current Mirror								
	Chapter Four: Operational Amplifiers and Filters	CLO4	4hr	-	2hr	-	4hr	5hr	15hr
	4.1 Ideal vs. non-ideal op-amps								
	4.2 Design of amplifiers and filters using op-amps								
	4.3 First and Second Order Filter Functions,								
	4.4 Butterworth and Chebyshev Filters								
	Chapter Five: ADC and DAC	CLO5	6hr	-	3h		4hr	7hr	20hr

					r				
	5.1 How ADCs work: sampling and quantization								
	5.2 Successive Approximation ADC : Operation and applications								
	5.3 How DACs function: converting digital signals to analog								
	5.4 Binary-weighted DAC: Circuit configuration and operation								
	5.5 Performance Metrics: Resolution, linearity, settling time, and power consumption								
	Total								82hr

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1hr
2	Lab	15%		√	24hr
3	Assignment	10%		√	8hr
4	Mid exam	20%	√		2.5.hr
Total					37.5 hr
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		50%	√		3hr
Grand Total SLT					120 hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face

Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software,	1	MATLAB Software
		2	Computer lab
		3	SPICE

	computer lab, simulation room …etc.)	4	MATLAB (Simulink)
1 3	Text book and reference: (note: ensure the latest edition /publication)	1	Behzad Razavi, Fundamentals of Microelectronics, Second Edition *University of California, Los Angeles*
		2	M. N. Horenstein, Microelectronic Circuits and Devices, Prentice Hall, 2nd ed., 1996.
		3	R. C. Jaeger, Microelectronic Circuit Design, McGraw Hill, 1997.
		4	S. Sedra and K. C. Smith, Microelectronic Circuits, 4th ed., 1997.
		5	Adel S. Sedra , K. C. Smith : Microelectronic Circuits: Microelectronic Circuits, Oxford University Press; 5th edition Nov 2003

	Adama Science and Technology University															
1	College: **COEEC**						Department: **ECE**									
2	Course Category	Major Elective														
	Course Name	Optoelectronics														
	Course Code:	ECEg3318														
3	Synopsis	In this course, students will study Optical properties of semiconductors, Optoelectronic material, Radiometry and Photometry, various Optics Lenses and Ray Tracing and Imaging. Comprehend wide range of optical diodes operation principles, structures, and their characteristics. Design conversant applications using lasers mechanisms, Types of Lasers, Modes of Operation.														
4	Name(s) of Academic Staff:															
5	Semester/Year offered:	Semester:	II	Year	3											
6	Credit Hour:	3														
7	Prerequisite:	None														
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:															
	CLO1	Investigate and analyse mathematical optical properties of semiconductors and familiar with optoelectronic materials.														
	CLO2	Examine the approaches of various Optical mirrors and lenses														
	CLO3	Evaluate mathematical operations, structure and applications of various optical LEDs.														
	CLO4	Evaluate mathematical operations, structure, working principle and applications of various Optical LASERs														
	CLO5	Design the applications of optical properties and processes in semiconductor optical detectors														
	CLO6	Design and Development conversant applications of semiconductor optical sources using various modulator mechanisms														
10	Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:															
	Course Learning Outcomes (CLO)	**Student Outcomes (SO)**														
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods	Assessment						
										Test	Quiz	Assignment	Project	Lab	Mid exam	Final exam

									L	T	P	O							
	CLO1	✓	✓						√	√								√	√
	CLO2	✓					✓		√	√				√	√			√	√
	CLO3	✓					✓	✓	√	√			√		√			√	√
	CLO4	✓					✓	✓	√	√			√						√
	CLO5	✓	✓				✓	✓	√	√			√		√				√
	CLO6	✓					✓	✓	√	√									√
	Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box																		

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB & Pspice programming Usage and Skill
	2	

11	**Distribution of Student Learning Time (SLT)**								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1 **OPTICAL PROPERTIES OF SEMICONDUCTORS**	CLO 1	4Hrs				3Hrs	5Hrs	**12 hr**
	1.32. 1.1. Introduction								
	1.33. 1.2. Maxwell Equation & Vector Potential								
	1.34. 1.3. Energy bands in solids								
	1.4. E-k diagram								
	1.5. p-n junctions								
	Chapter 2: **OPTICS**	CLO 2	4Hrs				4Hrs	6Hrs	**14 hr**
	2.1. Properties of Light								
	2.2.Radiometry and Photometry								
	2.3.Optical Mirrors								
	3.5. 2.4.Optical Lenses								
	2.5.Ray Tracing and Imaging								
	Chapter 3: **OPTICAL SOURCE LIGHT EMITTING DIODE**	CLO 3	6Hrs				6Hrs	8Hrs	**20 hr**
	3.1. Light-emitting diodes								
	3.2. LED structures								
	3.3. Homo junction LED								
	3.4. Hetero junction LED analysis								
	3.5. LED materials								
	3.6. From LED to laser								

	Chapter 4: Semiconductor Applications	CLO 4	4Hrs	5 Hrs			3Hrs	3 Hrs	**15 hr**
	4.1. Laser Evolution								
	4.2. Laser Materials								
	4.3. Principles of LASER Operation								
	4.4. Laser Dynamics & Modulation response								
	4.5. Types of Lasers								
	4.6. Modes of LASER Operations								
	Chapter 5: OPTOELECTRON DETECTORS	CLO 5	4Hrs	4 Hrs			4Hrs	4Hrs	**16 hr**
	5.1. Optical Absorption in a Semiconductor								
	5.2. Materials for Optical Detectors								
	5.3. Photocurrent in a P-N Diode								
	5.4. Photocurrent in a P-I-N Diode								
	5.5. Photo conductive detector								
	5.6. Photo Transistors								
	5.7. Advanced Detectors								
	Chapter 6: MODULATORS	CLO 6	4 Hrs	4 Hrs			4Hrs	6 Hrs	**18 hr**
	6.1. Light modulation and Modulator choices								
	6.2. Modulator parameters								
	6.3. Electro-optic modulators								
	6.4. High-speed electro-optic Modulator design								
	6.5. Electro absorption modulator								
	6.6. Electro absorption modulator Structures and parameters								
	6.7. Modulator and laser drivers								
								Total	**95 hrs.**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Test	10%	√		2 hr
2	Assignment 1	5%		√	9 hr
3	Mid exam	20%	√		2 hr
4	Assignment 2	10%		√	9 hr
				Total	22
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Opto Lab
		2	
2.		3	

13	Text book Reference:	1	Optoelectronics and Photonics Principles and Practices, S.O.KASAP
		2	Semiconductor Devices for High-Speed Optoelectronics, GIOVANNI GHIONE
		3	Frederick F. Driscoll; Robert F. Coughlin. Solid State devices and Fundamentals of Optoelectronics, CLIFFORD R. POLLOCK, Cornell University.
		4	Semiconductor Optoelectronics Physics and Technology, Jasprit Singh, McGraw-Hill,Inc.
		5	S. Wang, Fundamentals of Semiconductor Theory & Device Physics, Prentice Hall, 1989

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY								
1	**College: CoEEC**			**DEPARTMENT: CSE**				
2	**Course Category:**	Major Course						
	Course Title:	Object Oriented Programming						
	Course Code:	CSEg2202						
3	**Synopsis:**	In this course, students will explore the principles of object-oriented programming (OOP) and develop problem-solving skills using an object-oriented programming language. The course begins with a comparison of the structured programming paradigm and the object-oriented paradigm, including a brief review of control structures and data types, with a particular emphasis on structured data types and array processing. Subsequently, the course introduces the object-oriented programming paradigm, focusing on the definition and utilization of classes and objects. Key topics include inheritance, packages and interfaces, exception handling, file input/output (I/O), graphical user interfaces (GUI), and multithreading.						
4	**Academic Staff:**							
5	**Semester and Year offered:**	**Semester:**	II		**Year:**	2		
6	**Credit Hour:**	3	Lect:	2	Lab:	3	Tutor:	0
7	**Prerequisite / Co-requisite : (if any)**	CSE1102 (Fundamental of Programming)						
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:							
	CLO-1	Describe the importance of object-oriented programming (OOP) and differentiate it from structured programming, highlighting its advantages and applications.						
	CLO-2	Explain key object-oriented programming concepts, including data abstraction, encapsulation, information hiding, inheritance, and polymorphism, with relevant examples.						
	CLO-3	Apply object-oriented programming principles to develop solutions for real-world problems using Java.						

CLO-4	Design and implement Java applications to manipulate files effectively, ensuring proper exception handling techniques are utilized.
CLO-5	Create GUI-based Java applications to address real-world problems, incorporating user interface design and functionality.

9 Mapping of Course Learning Outcomes (CLOs) to the Student Learning Outcomes (Sos), Teaching Methods and Assessment

Learning Outcomes (CLOs)	**Student Learning Outcomes (SOs)**									**Teaching Methods**				**Assessment**					
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	SO-8	SO-9	Lec	Lab/Tut	PBL	GD	Test	Quiz	nt	Mid Exam	Project	Final
CLO-1	√									√	√			√			√		√
CLO-2	√									√	√			√			√		√
CLO-3			√							√	√				√	√	√		√
CLO-4		√								√	√				√				√
CLO-5					√					√	√				√	√		√	√

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	
2	
3…etc.	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Guided Learning (F2F)				**Guided Learning (NF2F)**	**Independent Learning (NF2F)**	**Total (SLT)**
		L	T	P	O			
Chapter 1 - Introduction: Programming Paradigms, History of Java, Features of Java, Java vs C++, Java Environment setup, JDK, JRC, JVM	CLO 1	√				3		3
Chapter 2 - Object and Class: Class, Object, Data types, Variables, Operators, Java Program Structure, SOP Statement, Control Statements, Constructors, Wrapper Class, Naming Convention, Array in java	CLO 2	√		√		12	2	14

	Chapter 3 - Inheritance: Aggregation, Overloading and Overriding Methods, In boxing and Out boxing Supper and Final Keyword, Polymorphism, Abstract Class	CLO 2,3	√		√		12	1	13
	Chapter 4 - Package and Interface: Interface, Package, Access modifiers, Encapsulation	CLO 3	√		√		9	2	11
	Chapter 5 - Exception Handling: Types of Exception, Hierarchy of Exception Handling, Try-Catch-Final Blocks, User Defined Exceptions	CLO 4	√		√		10	2	12
	Chapter 6 - File and I/O: I/O Streams, Hierarchy Chart for byte Streams, File I/O Stream, Date I/O Stream, String Handling and Tokenization	CLO 4	√		√		8	1	9
	Chapter 7 - GUI: Java Swing, Window Component, Event Delegation Model, Event-Driven programming and Event Handling	CLO 5	√		√		8	2	10
	Chapter 8: Multithreading: Thread, State of a Thread, Thread API, Synchronization, Inter-Thread Communication.	CLO 5	√		√		9	1	10
13	**Assessment**								
	Continuous Assessment	Percentage Total (50%)					F2F	NF2F	SLT
	Test	5					1	3	4

	Quiz	5	2	0	2
	Assignment	10	1	3	4
	Mid Exam	20	1	5	6
	Project	10	4	10	14
	Final Exam	Percentage Total (50%)	F2F	NF2F	SLT
	Final Exam	50	3	7	10
	Grand Total SLT				122
	L = Lecture, T = Tutorial, PBL = Problem based learning, GD = Group Discussion, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.				

14	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	Software: JDK and NetBeans IDE or any Text Editor
		2	Computer Laboratory
		3	
		4	
		5	
15	Text book and reference: (note: ensure the latest edition /publication)	1	"Java: How to Program", P.J. Deitel & H.M Deitel, 11th Edition Pearson Education, 2017.
		2	"Java: The Complete Reference", Herbert Schildt, 11th Edition, Tata McGraw Hill, 2019.
		3	
	web sources	1	https://www.javatpoint.com/java-tutorial
		2	https://docs.oracle.com/javase/tutorial/

	ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY								
1	**College: CoEEC**					**DEPARTMENT: Software Engineering**			
2	**Course Category:**	Major Mandatory							
	Course Title:	Introduction to Artificial Intelligence							
	Course Code:	SEng4208							
3	**Synopsis:**	This course is an introductory course on Artificial Intelligence (AI) that presents an overview of AI principles and approaches. It will introduce the basic principles in artificial intelligence research, simple representation schemes, problem solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, programing in logic, inference and reasoning mechanism, natural language processing, expert systems, vision and robotics will be explored. The PROLOG and others AI programming language will also be introduced.							
4	**Academic Staff:**	**Mr. Rabira Geleta**							
5	**Semester and Year offered:**	**Semester:**	II			Year:	**IV**		
6	**Credit Hour:**	3	Lect:	2	Lab:	3	Tut:	0	
7	**Prerequisite / Co-requisite: (if any)**	None							
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:								

CLO-1	Discuss the basic principles of AI and different types of AI agents.
CLO-2	Identify various AI search algorithms.
CLO-3	Apply knowledge representation, reasoning, and machine learning techniques to real-world problems.
CLO-4	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
CLO-5	Develop a simple knowledge-based system.

9 Mapping of Course Learning Outcomes (CLOs) to the Student Learning Outcomes (Sos), Teaching Methods and Assessment

Learning Outcomes (CLOs)	**Student Learning Outcomes (SOs)**									**Teaching Methods**		**Assessment**				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	SO-7	SO-8	SO-9	Lec.	Lab	Quiz	nt	Mid Exam	Project	Final Exam
CLO-1	√									√			√	√		√
CLO-2	√									√	√	√		√		√
CLO-3		√								√	√		√	√		√
CLO-4		√								√	√					√
CLO-5						√				√	√		√			√

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Machine Learning
2	Robotics
3	Expert Systems

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Guided Learning (F2F)		**Guided Learning (NF2F)**	**Independent Learning (NF2F)**	**Total (SLT)**
		L	P			
1. Chapter One: Introduction to Artificial Intelligence 1.1. Definitions and Views of	CLO1	3	5	8	2	10

	Artificial Intelligence (Intelligence, AI, AI Thoughts), 1.2. Brief History and foundations of AI 1.3. Roles of AI 1.4.Main Areas of AI 1.5. Achievements and Big Open Questions						
	2. Chapter Two:Intelligent Agents 2.1 Definitions(Agent, Intelligent Agent) 2.2. Agent Types(Rational, Omniscience Agent, Ideal Rational Agent, etc.), Properties of an Agent 2.3. Parts of an Agent 2.4.Factors to measure rationality of Agents 2.5.Structure of Intelligent Agents 2.6.Agent types based on their memory and Actions, and Nature of Agent Environments	CLO1	6	6	12	3	15
	3. Chapter Three:Problem Solving 3.1. Solving Problems by Searching (informed, Uninformed 3.2. Beyond Classical Search(Simulated Annealing, Genetic algorithms) 3.3. Legitimacy of Intellectual Property Protection for Software	CLO2, 3	6	8	14	3	17
	4. Chapter Four: Knowledge and Reasoning 4.1 Logical Agents 4.1. Logical Agents 4.2. First-Order Logic 4.3.Inference in First-Order Logic 4.4.Classical Planning, Planning and Acting in the Real World 4.5. Knowledge Representation	CLO4	2	4	6	2	8
	5. Chapter Five:Uncertain Knowledge and Reasoning 5.1. Quantifying Uncertainty	CLO4	4	5	9	1	10

	5.2. Probabilistic Reasoning 5.3. Probabilistic Reasoning over Time 5.4.Making Simple Decisions, Making Complex Decisions						
	6. Chapter Six: Learning 6.1. Learning from Examples, Knowledge in Learning 6.2. Learning Probabilistic Models, Reinforcement Learning, or Machine	CL O4	4	5	9	1	10
	7. Chapter Seven: Communicating, Perceiving and Acting 7.1. Natural Language Processing 7.2. Natural Language for Communication 7.3. Perception, Robotics	CL O5	4	5	9	1	10
13	**Assessment**						
	Continuous Assessment	Percentage Total (50%)			F2F	NF2F	SLT
	Quiz	5			1		1
	Assignment	5			2	4	6
	Mid Exam	25			2	6	8
	Project	15			2	10	12
	Final Exam	Percentage Total (50%)			F2F	NF2F	SLT
	Final Exam	50			3	10	13
	Grand Total SLT						120
	L = Lecture, T = Tutorial, PBL = Problem based learning, GD = Group Discussion, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.						
14	Special requirements and resources to deliver the course .	1	Development Tools: SWI-Prolog, and Python				
		2	Computer Lab				
15	Text book and reference: (note: ensure the latest edition /publication)	1	Russell and P. Norvig. Artificial Intelligence: A Modern Approach. 6th edition. Prentice Hall, 2016.				
		2	Introduction to Artificial Intelligence, Rajendra Akerkar; Prentice Hall of India, 2009.				
		3	Artificial Intelligence: Structures and Strategies for Complex Problem Solving, George Luger; Benjamin Cummings, 2004				
		4	Introduction to AI and Expert Systems, D. W. Patterson; PHI, 2012. Nilsson, Nils (1998). Artificial Intelligence: A New Synthesis. Morgan Kaufmann Publishers Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence: A Modern Approach, Prentice Hall NPTEL Videos: Artificial Intelligence				
		5	Massive Open Online Courses				

	Adama Science and Technology University	
1	College: **COEEC**	Department: **EPCE**
2	Course Category	Major Elective
	Course Name	**Introduction to Control Systems**
	Course Code:	EPCE3304
3	Synopsis:	The course deals with the following major points: - introduction to control system, control system modelling of physical system, time domain analysis of control systems, Root locus analysis, frequency domain analysis and classical controller design techniques.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: II Year 43
6	Credit Hour:	3(2hrs Lecture, 3hrs Laboratory)
7	Prerequisite:	EPCE3201

8 Course Learning Outcome (CLO): At the end of the course the student will be able to:

CLO1	Discuss basic concepts of control system and identify different components of control system
CLO2	Apply the knowledge of mathematics for modeling of control systems and formulate the electrical, mechanical, hydraulic and other system
CLO3	Compute the time domain analysis, root locus, frequency domain analysis and determine the stability analysis of control system
CLO4	Analyze the performance of uncontrolled system by determining system parameter (transient and steady-state parameters)
CLO5	Design compensators and classical controller by using different techniques
CLO6	Analyze the performance of controller

9 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)																	
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment						
								L	T	P	O	Test	Quiz	Assignment	Project	Lab Exam	Mid exam	Final exam
CLO1	√		-	-	√	√	√	√	√	√	-	√	-	-	-	-	√	√
CLO2	√		-	-	√	√	√	√	√	√	-	√	-	-	-	√	√	√
CLO3	√	√	-	-	√	√	√	√	√	√	√	√	-	-	-	√	√	√
CLO4	-	√	-	-	√	√	√	√	√	√	√	-	-	√	-	√	-	√
CLO5	-	√	-	-	√	√	√	√	√	√	√	-	-	√	-	√	-	√
CLO6	-	√	-	-	√	√	√	√	√	√	√	-	-	√	-	-	-	√

Indicate the relevancy between the CLO and SO by ticking “√” on the appropriate relevant box

10 Transferable Skills (Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB Usage and programming Skill
2	Lab demonstration

11 Distribution of Student Learning Time (SLT)

		Teaching and Learning Activities	SLT

	Course Content Outline	CLO	Guided learning (F2F)				Guided learning (NF2F)		
			L	T	P	O			
	Chapter One: **Introduction to control systems**	CLO1	4	0	1			1	6hr
	1.1. Definition and importance of control systems. 1.2. Components of control system. 1.3. Classifications of control system. 1.4. Types of control system 1.4.1. Open loop system 1.4.2. Closed loop system Applications of control system in electronics and communication.								
	Chapter Two: **Mathematical modeling of physical system**	CLO2	8	0	6		2	2	18hr
	2.1 Differential equations and system dynamics 2.2 Control system modelling 2.1.1. Electrical system. 2.1.2. Mechanical system. 2.1.3. Electromechanical 2.3 Transfer function and impulse response. 2.4 Block diagram (BD) Signal flow graph and Mason's Gain Formula								
	Chapter Three: **Time domain Analysis of control system.**	CLO3	12	0	6		2		21hr
	3.1. Introduction 3.2. Steady state Analysis 3.3. Analysis of steady state error 3.4. Type of Input and steady state error 3.5. Transient response analysis. 3.6. Transient response specifications. 3.7. Analysis and Design of Feedback Systems 3.8. Stability Analysis in S-domain. 3.8.1. Effect of Location of Poles on stability Routh-Hurwitz Criteria and Special Cases								
	Chapter Four: **Root-Locus Method**	CLO3	8	0	6		2		17hr

	4.1. Fundamentals of Root-Locus 4.2. Angle and Magnitude Condition 4.3. General methods for Construction of Root locus 4.4. Steps for Solving Problems on Root Locus 4.5. Gain Margin and phase margin 4.6. Root Locus with Positive Feedback 4.7. Root Contour 4.8. Effect of Addition of Poles and Zeros. Advantage of root locus								
	Chapter Five: **Frequency Domain Analysis.**	CLO4	12	0	6		2	1	21hr
	5.1. Introduction to Frequency Response 5.2. Introduction to bode plot 5.2.1. Logarithmic Plot 5.2.2. Step to sketch bode plot 5.2.3. Stability analysis using bode plot 5.3. Polar Plot 5.3.1. Polar Plot of Standard Function 5.3.2. Stability determination from polar plot. 5.4. Nyquist Plot Analysis 5.4.1. Basic Definitions 5.4.2. Nyquist Analysis Stability in frequency domain								
	Chapter Six: **Controller Design Techniques.**	CLO5 CLO6	12	0	6				19hr
	6.1. Type of Compensation 6.1.1. Series compensation 6.1.2. Parallel compensation 6.1.3. Series-parallel compensation. 6.2. Control Systems Design by Frequency-Response Approach (Phase-lead, phase-lag, lead-lag compensation) 6.3. PID controllers, architectures and model 6.3.1. Design of PID Controllers with Frequency-Response Approach 6.3.2. Design of PID Controllers with Computational Optimization Approach 6.4. PID Tuning methods Ziegler–Nichols Rules for Tuning PID Controllers.								
	Chapter One:	CLO1	4	0	1				6hr

	Introduction to control systems						
						Total	**95hr**

12	Assessment					
	Continuous Assessment		**Percentage Total-50(%)**	**F2F**	**NF2F**	**SLT**
	1	Test(s)	10	√		1hr
	2	Assignments	10	√	√	10hr
	3	Lab report	10	√	√	22hr
	4	Mid exam	20	√		2hr
					Total	**35**
	Final Exam	**Percentage 50(%)**	**F2F**	**NF2F**		**SLT**
	Final Exam	50%	√			**3hr**
					Total	**160hrs**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face.					

13	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	MATLAB Software
		3	Workshop
	Text book Reference: (note: ensure the latest edition /publication)	1	A. Nagoorkani, Control Systems, RBA Publications, 2nd edition, 2006.
		2	U.A.Bakshi, V.U.Bakshi, Control Systems, Technical Publications, 2010.
		3	Katsuhiko Ogata, Modern Control Engineering, Pearson Education Publishers, 5th edition, 2010.
		4	Nagrath I.J. and Gopal M, Control Systems Engineering, New Age International Publications, 5th edition, 2010.
		5	Norman Nise, Control System Engineering, John Wiley &Sons, Inc., 6th edition, 2011.
		6	N.C Jagan. Control Systems, 2nd edition, BS Publications, 2008
		7	Smarajit Ghosh, Control Systems theory and application,2007

	Adama Science and Technology University					
1	College: **COEEC**		Department: **EPCE**			
2	Course Category	Major Elective				
	Course Name	**Introduction to Electrical Machines**				
	Course Code:	EPCE 3302				
3	Synopsis	The course deals with the following major points: - Electromagnetic principles; Transformers; 3-Phase Induction motors; D.C Machines.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	3	
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)				
7	Prerequisite:	EPCE2101				
8	Student Outcome (PO): Adopted from ABET					
	SO1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.				

	SO2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
	SO3	An ability to communicate effectively with a range of audiences.
	SO4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
	SO5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
	SO6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	SO7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Discuss the fundamental concepts and relevant technique in solving and analyzing different Electrical networks in different conditions
	CLO2	Apply mathematical knowledge to analyze and synthesize networks in time and frequency domain and estimate the performance of a particular network
	CLO3	Examine modeling techniques of active and passive electrical networks
	CLO4	Design one port and two port active and passive networks
	CLO5	Design of filters.

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)																	
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment						
								L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√	-	-	-	√	√	-	√	√	√	-		-	√	-	√	√	√
CLO2	√	√	-	-	√	√	-	√	√	√	-		-	√	-	√	√	√
CLO3	√	√	-	-	√	√	-	√	√	√	-	√	-	√	-	√	-	√
CLO4	√	√	-	-	√	√	-	√	√	√	-	√	-	√	-	√	-	√
CLO5	√	-	√	√	√	√	-	√	√	√	-	-	-	√	-	√	-	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1 Setting up laboratory experiments of electrical machines and analysis of test results

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Electromagnetic principles	CLO1	4	3	6		2	3	14 hrs.
1.35. Concepts on different types of								

	electrical machines, (stationary & rotating)								
	1.36. Magnetics, magnetic fields and electromagnetic relationships								
	1.37. Magnetic circuit parameters calculation								
	1.38. Saturation and Hysteresis 1.39. Eddy current and eddy current losses								
	1.40. Electromagnetic Induction 1.41. Electromagnetic Forces and Torque.								
	Chapter Two: Introduction to Transformers	CLO2 CLO5	6	3	9		4	5	25hrs.
	2.1. Introduction, 2.2. Construction of Transformers 2.3. Principle of transformer action, Ideal Two-Winding transformer								
	2.4. Transformer Equivalent Circuit, Phasor Diagrams and transformer Tests								
	2.5. Voltage Regulation of a Transformer 2.6. Transformer Losses and Efficiency.								
	2.7. Three-Phase Transformers and group connections.								
	2.8. Construction & Principal operation of Autotransformers								
	Chapter Three: Three- phase Induction Machines	CLO3 CLO5	4	6	9		5	6	28hrs.
	3.1. Introduction 3.2. Construction features of induction machines 3.3. Principles of Rotating Magnetic field 3.4. Operation Principle of 3-Phase Induction machines 3.5. Synchronous speed and slip								
	3.6. Equivalent Circuit model of induction machine 3.7. Determination of Equivalent Circuit Parameters and Phasor Diagram,								
	3.8. Performance Characteristics of 3-phase induction machine								
	3.9. Starting methods & speed control principles of 3-phase								

	induction motors.								
	Chapter Four: DC machines	CLO4 CLO5	6	6	9		3	4	25hrs.
	4.1. Construction, principle of operation and types of DC Machines								
	4.2. Armature reaction and commutation process of DC machines								
	4.3. Operation and performance characteristics of DC machines								
	4.4 Losses and efficiency in DC machines								
	4.5. Comparison of Motor and Generator Action								
								Total	**92 hrs.**

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Test(s)	10	√		2 hr
	2	Assignment	5		√	6 hrs.
	3	Lab report and Exam	15	√	√	15hrs.
	4	Mid exam	20	√		2 hrs.
					Total	25hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Electrical Machine lab room, lab equipment & required measuring instruments and devices,
		2	Lab Manuals

13	Text book/ Reference:	1	John Hindmarsh, Electrical Machines and their Application, 4th edition.
		2	U.A. Bakshi, M.V. Bakshi, Electrical Machines, 4th edition, 2018, Technical publication
		3	Dr.P.S. BIMBHRA-Electrical Machinery theory, Performance and applications, 6th edition.
		4	J.B. Gupta, Theory and Performance of Electrical Machines, 15th edition
		5	Stephen J. Champman, electrical machinery Fundamentals 2nd Education Mc, Graw Hill.
		6	Ryff Peter F. Electrical Machines and Transformers Principles and Applications.
		7	Girma Mullisa, Electrical Machines, Electrical Engineering Department, AAU, 1992
		8	Kosow: Electric Machinery and Control, Prentice-Hall.
		9	Siskind: Electrical Machines, McGraw-Hill.

	Adama Science and Technology University	
1	College: SOEEC	

2	Course Category	Major Elective
	Course Name	**Industry Internship-I**
	Course Code:	ECEg3200
3	Synopsis:	Encourage students to apply theoretical knowledge gained throughout their academic studies in industrial environments. Acquire practical industry experience and insight into real world engineering challenges. Develop student's professional competencies, problem solving skills, project management abilities, and teamwork experience. Prepare students for their transition into the workforce by enhancing their communication and technical reporting skills. Foster innovation by engaging students in industry based project design, where they identify, analyze, and solve engineering problems. Strengthen the cooperation among universities and industries.
4	Name(s) of Academic Staff:	

5	Semester/Year offered:	Semester:	III	Year	3	
6	Credit Hour:	3				
7	Prerequisite:	All Previous major courses				

9	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Gain a comprehensive understanding of the host company's profile, including its history, mission, organizational structure, and technological structure.
	CLO2	Observe and describe the technical structures & operational workflows within the host company including tools, technologies, and software used in technical processes.
	CLO3	Participate in the planning, design, development, operation and evaluation phase's system using industry standard tools and methodologies.
	CLO4	Identify technical challenges, proposing solutions, and implementing effective problem solving strategies to optimize system performance.
	CLO5	Write a comprehensive final report about the internship experience, technical tasks performed, problems identified and solved, and overall contributions to the host company.

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	**Student Outcomes (SO)**														
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment			
								L	T	P	O	Advisor evaluation & Paper writing	Host Company evaluation	p Document ion	presentatio n
CLO1							✓			√		√	√	√	√
CLO2						✓				√		√	√	√	√
CLO3		✓								√		√	√	√	√
CLO4	✓									√		√	√	√	√
CLO5			✓							√		√	√	√	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Team work

11	**Distribution of Student Learning Time (SLT)**			
			Teaching and Learning Activities	Total (SLT)

	Course Content Outline	CLO	Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter one: **INTRODUCTION TO INDUSTRIAL INTERNSHIP**	CLO1	-	-	4hr	-	-	-	4hr
	1.1 Course Overview: 1.2 Objectives of the Industrial Internship: 1.42. Benefits of Industry Collaboration:								
	Chapter two 1.43. **HOST COMPANY ANALYSIS**	CLO2	-	-	4hr	-	-	-	4hr
	2.1 Company Profile and History:. 2.2 Organizational Structure: 1.44. 2.3 Technological and Technical Structures:								
	Chapter Three: 1.45. **INTERNSHIP EXPERIENCE AND ACTIVITIES**	CLO3	-	-	4hr	-	-	-	4hr
	3.1 Technical Structures & Workflow: 3.2 Project Involvement and Participation: 3.3 Collaboration and Teamwork:. 3.4 Skills Development and Training: 1.46.								
	Chapter four: **PROBLEM IDENTIFICATION AND PROPOSAL DEVELOPMENT**	CLO4	-	-	4hr	-	-	-	4hr
	4.1 Identifying Critical Problems: 4.2 Analyzing Problems and Context: 4.3 Problem-Solving & Innovation: 2.9. 4.4 Developing Proposals:								
	Chapter five: 2.10. **COMPREHENSIVE REPORTING AND REFLECTIVE ANALYSIS**	CLO5	-	-	4hr	-	-	-	4hr
	5.1 Technical Reporting: 5.2 Personal and Professional Growth: 5.3 Transitioning to the Workforce: 5.4 Comprehensive Report Preparation:. 5.5 Presentation of Findings: 5.6 Conclusion and Recommendations:								

					Total	**92 hrs.**
	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Advisor evaluation & Paper writing	20	√		**20hr**
	2	Host Company evaluation	25	√		**97hr**
					Total	117hr
	Final Exam		Percentage 55 (%)	F2F	NF2F	SLT
	Documents and presentation		55	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		1	Simulation Room		
			2	Different practical implementation lab		
			3	Manuals		
13	Text book/ Reference:	1	Adama Science and Technology University: Internship Guidline			
		2	Different text book and references according to their needs.			

Adama Science and Technology University						
1	College: CoEEC			Department: ECE		
2	Course Category	Major Mandatory				
	Course Name	Computer Architecture and Organization				
	Course Code:	ECEg4201				
3	Synopsis:	This course focus on: Computer Arithmetic; The Central Processing Unit: Architecture and Instruction Set; Instruction Format and Addressing Modes; Register Transfer Descriptions; Organization of the Arithmetic and Logic Unit; The Control Unit Realization: Hardwired and Micro programmable; The Memory Hierarchy and Memory Management; Input-Output Devices; Software of a Computer System; Design of a Small Computer System Testing				
4	Name(s) of Academic Staff:	TBA				
5	Semester and Year offered:	Semester:	I	Year :	IV	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	ECEg3201 Digital Logic Design				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					

	CLO1	Illustrate various elementary concepts of computer architecture including, syntax of register transfer language, micro operations, instruction cycle, and control unit.
	CLO2	Describe the design of basic computer with instruction formats & addressing modes
	CLO3	Explore various input output, memory management techniques and algorithms for performing addition, subtraction, and division etc
	CLO4	Interpret the concepts of pipelining, multiprocessors, and inter processor communication

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)								Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7		L	T	P	O	Test	Quiz	Assignment	Mid Exam	Final Exam
CLO1							√		√	√				√		√	√
CLO2							√		√	√					√	√	√
CLO3		√							√	√			√		√		√
CLO4						√	√		√	√					√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Assembly Language
2	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Introduction**	CLO 1	4hr				2hr	4hr	10hr
1.1 Organization and architecture								
1.2 Computer evolution								
1.3 Performance								
Chapter 2: **Computer Arithmetic**	CLO 1	2hr	2hr		2hr	2hr	2hr	10hr
2.1 Integer representation								
2.2 Integer arithmetic								
2.3 Floating-Point arithmetic								

	2.4 Floating-Point arithmetic								
	Chapter 3: **CPU**	CLO 2	8hr	6hr		5hr	6hr		25hr
	3.1 Instruction sets								
	3.2 Instruction format and addressing modes								
	3.3 RISC and CISC								
	3.4 CPU Structure								
	3.5 The Control Unit (Hardwired and Micro programmed)								
	3.6 Basic computer Design								
	Chapter 4: **Memory Systems**	CLO 3	6hr	5hr		4hr	5hr		20hr
	4.1 Classification and hierarchy of Memory systems								
	4.2 Main memory								
	4.3 Cache Memory								
	4.4 Secondary Memory								
	4.5 Other types of memory								
	4.6 Memory Management								
	Chapter 5: **Input and Output Systems**	CLO 3	6hr	4hr			4hr	6hr	20hr
	5.1 Modes of transfer								
	5.2 I/O interface								
	5.3 Techniques used for I/O Operations:								
	5.3.1 Programmed,								
	5.3.2 Interrupt-driven,								
	5.3.3 Direct Memory Access								
	Chapter 6: **Advanced Concepts**	CLO 4	4hr				3hr	3hr	10hr
	6.1 Pipelining								
	6.2 Introduction to parallel processing,								
	6.3 Introduction to operating systems								
	6.4 Cloud Computing								
	6.5 Quantum Computing								
	Total								95hr
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Quiz	5	1 hr		1 hr
	2	Test	10	1hr		1 hr
	3	Project + Presentation	15		8hr	8 hr
	4	Mid Exam	20	2hr		2 hr
	Total					22hr
	Final Exam		Percentage50 (%)	F2F	NF2F	SLT
	Final Exam			3 hr		3 hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	
		2	
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Textbook and reference: (note: ensure the latest edition /publication)	1	William Stallings: Computer Organization and Architecture
		2	M.M.Mano: Computer System Architecture
		3	Barry Wilkinson: Computer Architecture Design and Performance
		4	David A Patterson and JohnL.Hennessy: Computer Architecture A Quantitative Approach
		5	David A Patterson and JohnL.Hennessy: Computer Organization and Design Hardware/Software Interface

Adama Science and Technology University			
1	College: CoEEC		Department: ECE
2	Course Category	Major Mandatory	
	Course Name	Digital Communication	
	Course Code:	ECEg4203	
3	Synopsis:	Comprehensive introduction to digital communication principles. The major part of the course is devoted to studying how to translate information into a digital signal to be transmitted, and how to retrieve the information back from the received signal in the presence of noise and inter-symbol interference (ISI). Various digital modulation schemes are discussed through the concept of signal space. Analytical and simulation models for digital modulation systems are designed and implemented in the presence of noise and ISI. Optimal receiver models for digital baseband and band-pass modulation schemes are covered in detail. Baseband transmission and Optimal Reception of Digital Signal will be also covered. This course will also give knowledge on information theory and coding.	

4	Name(s) of Academic Staff:	TBA			
5	Semester and Year offered:	Semester:	I	Year:	IV
6	Credit Hour:	3			
7	Prerequisite/ Co-requisite: (if any)	Introduction to Communication systems- ECEg3202			

8 Course Learning Outcome (CLO): At the end of the course the student will be able to do:

CLO1	Apply the concept of random variable and power spectral density to analyze the characteristics of information.
CLO2	Investigate pulsed modulation system using sampling and quantization methods and analyze their system performance.
CLO3	Analyze various multiplexing techniques.
CLO4	Analyze different digital modulation schemes and compute the bit error performance.
CLO5	Design and implement the matched filters or optimal receiver to enhance the performance of communication system in presence of noise.
CLO6	Apply the concept of information theory in source coding and channel coding to enhance the performance of digital transmission.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (PO)															
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Laboratory	Quiz	Assignment	Mid Exam	Final Exam
CLO1	√							√		√				√	√	√
CLO2	√							√		√		√		√	√	√
CLO3		√						√		√		√	√	√	√	√
CLO4		√						√		√		√		√		√
CLO5	√		√					√		√		√		√		√
CLO6	√							√						√		√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB and LabVIEW software's
2	Digital Communication Systems Module
3	

11 Distribution of Student Learning Time (SLT)

		Teaching and Learning Activities	Total (SLT)

	Course Content Outline	CLO	Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: **Review on Random and Stochastic Process**	CLO1	4	-	-		3	3	10hr
	1.1 Review of Probability Theory								
	1.2 Stochastic Process								
	1.3 Mathematical Definition Stochastic Process								
	1.4 Mean Correlation, and Covariance Functions of Weakly Stationary Process								
	1.5 Ergodic Process								
	1.6 Power Spectral Density								
	1.7 Narrow Band Noise								
	1.8 Poisson Process and Gaussian Process								
	Chapter 2: **Base Band Pulse Signaling**	CLO2	4		3		2	3	12hr
	2.1 Introduction								
	2.2 The sampling theorem								
	2.3 Pulse Analog Modulations • PAM • PWM • PPM								
	2.4 Quantizing and Encoding								
	2.1 PCM, DPCM, DM & ADM								
	2.2 Effect of noise in Pulse Analog Modulation (PAM) and PCM								
	Chapter 3: **Digital Multiplexers**	CLO3	2		3		2	3	10hr
	3.1 Introduction								
	3.2 Model for data communication								

	3.3 TDM and PCM frames								
	3.4 Digital carrier systems (T and E carrier system) and multiplexing								
	Chapter 4: **Digital Modulation Techniques**	CLO4	6		6		3	5	20hr
	4.1 Introduction								
	4.2 Types of Digital Modulations Techniques: ASK, FSK and PSK								
	4.3 Bandwidth and Frequency Spectrum of ASK, BPSK, FSK.								
	4.4 Coherent and Non coherent of digital modulation techniques FSK Detector								
	4.5 FSK Detection Using PLL, BPSK, Coherent PSK Detection, QPSK, Differential PSK.								
	4.6 M-ary Modulation Techniques: M-ary FSK M-ary PSK, QASK								
	Chapter 5: **Baseband transmission and Optimal Reception of Digital Signal**	CLO5 & CLO1	4		6		2	4	16hr
	5.1 Pulse shaping for optimum transmissions								
	5.2 Optimum Receiver, Optimal Coherent Reception.								
	5.3 Signal Space Representation and Probability of Error, eye diagrams, Cross talk.								
	Chapter 6: **Information and Theory and Channel coding**	CLO6 & CLO1	2				2	4	10hr
	6.1 Information and entropy, conditional entropy, and								

	redundancy,								
	6.2 Shannon-Fano coding, Mutual Information,								
	6.3 Information loss due to noise, source coding - Huffman Code,								
	Total								78hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5%	√		1hr
	2	Laboratory	15%	√	√	28hr
	3	Assignment 1	10%		√	8hr
	4	Mid exam	20%	√		2hr
	Total					39hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			√		3hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face Note: Indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	Computer lab
		3	LabVIEW Software
		4	Communication Lab
		5	Choose an item.
13	Textbook and reference: (note: ensure the latest edition /publication)	1	Digital Communications - John G. Proakis . Masoud salehi, 5th Edition, McGraw-Hill, 2008.
		2	Analog and Digital Communication Systems-Dr. Sanjay Sharma,6th Edition, Delhi 2012
		3	Communication Systems 4th Edition Simon Haykins
		4	Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

Adama Science and Technology University			
1	College: CoEEC		Department: ECE
2	Course Category	Major Mandatory	
	Course Name	EM Waves and Guided Structure	

	Course Code:	ECEg4205				
3	Synopsis:	Review of Vectors and Maxwell's Equations: Scalar & Vector Fields; Line, Surface, & Volume Integrals; Gradient of a Scalar field, Divergence & Curl of a Vector Field, the Divergence &Stokes's Theorems, Laplacian of a Scalar Field; Solenoid &Irrotational Vector Fields, Helmholtz's Theorem; Field Quantities; Maxwell's Equations; Boundary Conditions; Time-Harmonic Fields. Position's Equations and Laplace's Equations, Electromagnetic Wave Propagation: Waves in General; Wave Propagation in Lossy Dielectrics; Plane Waves in Free Space; Plane Waves in Lossless Dielectrics; Plane Waves in Good Conductors; Power and Poynting Vector, Poynting Theorem; perpendicular Polarization parallel polarization standing waves Refection of Plane Wave at Normal and Oblique Incidence; Summary of TEM Waves, Transmission Lines: Electrical Dimension, Circuit and Field Analysis; Transmission Line Equations; Input Impedance, SWR, and Power; The Smith Chart; Some Application of Transmission Lines. Transients in loss less lines Waveguides: Rectangular Waveguides; TM Modes; in two dimensional planar TE Modes; Power Transmission and wave guide, coupling matching and Attenuation; Waveguide Resonators. Powers transmitted in a lossless wave guide. Power dissipation in a lossy wave guide.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	IV	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	EPCE2202: Electromagnetic Field				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Define and recognize different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of EM field theory.				
	CLO2	Characterize dynamic EM fields & waves and derive the Maxwell's Equations to analyze & solve wave propagation problems with simple boundary conditions & interpret the results.				
	CLO3	Analyze wave propagation in lossless and lossy media and calculate parameters such as attenuation and propagation constants, phase velocity, power density, etc.				
	CLO4	Describe the polarization of an electromagnetic wave and derive Poynting's theorem for power conservation in electromagnetic systems.				
	CLO5	Discuss the concept of transmission line and describe the mechanism for wave propagation and reflection along a transmission line.				
	CLO6	Solve practical transmission line parameter and impedance matching through analytical and graphical tools such as Smith chart.				
	CLO7	Analyze waveguides structures & propagating modes in rectangular waveguides and resonators.				
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:					
	Cou	Student Outcomes (SO)				

	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Quiz	Test	Project	Mid exam	Final Exam
CLO1	√							√	√						√	√
CLO2		√						√	√	√		√			√	√
CLO3						√		√	√	√			√	√		√
CLO4	√							√	√	√			√	√		√
CLO5		√						√	√	√				√		√
CLO6					√			√	√	√				√		√
CLO7							√	√	√	√						√

Indicate the relevancy between the CLO and SO by ticking “√” on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB software
2	Smith Chart
3	Lab view

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Major Topics								
Chapter 1: **Mathematical Review**	CLO1	4hr	6hr	-	-	2hr	4hr	16hr
1.1 Scalar & Vector Fields								
1.2 Line, Surface, & Volume Integrals								
1.3 Gradient of a Scalar field								
1.4 Divergence & Curl of a Vector Field								
1.5 Laplacian of a Scalar Field								
1.6 Solenoid & Irrotational Vector Fields								
1.7 Helmholtz’s Theorem								

	Chapter 2: **Maxwell's Equation**	CLO1, CLO2	4hr	6hr	1h r	-	3hr	6hr	20hr
	2.1 Faraday's Laws								
	2.2 Transformer and Motional EMF								
	2.3 Displacement Current								
	2.4 Time-Varying Boundary Conditions								
	2.5 Time Harmonic Fields								
	Chapter 3: **Electromagnetic Wave Propagation**	CLO3, CLO4,	6hr	9hr	2h r	-	1hr	3hr	21hr
	3.1 Waves in General								
	3.2 Wave Propagation in Lossy Dielectrics								
	3.3 Plane Waves in Free Space;								
	3.4 Plane Waves in Lossless Dielectrics								
	3.5 Plane Waves in Good Conductors								
	3.6 Wave Polarization								
	3.7 Power & the Poynting Vector								
	3.8 Refection of Plane Wave at Normal and Oblique Incidence;								
	Chapter 4: **Transmission Lines**	CLO5, COL6	8hr	12h r	3h r	-	1hr	4hr	28hr
	4.1 Introduction								
	4.2Transmission Line Parameters								
	4.3 Transmission Line Equation								
	4.4 Input Impedance, Standing Wave Ratio and Power flow								
	4.5 Smith Chart								
	4.6Applications of Transmission Lines								
	4.6 Transients on Transmission Lines								
	4.7 Bounce Diagrams								
	Chapter 5: **Waveguides**	CLO7	4hr	6hr	2h r		1hr	4hr	17hr

	5.1 Rectangular Waveguides								
	5.2 Propagations Modes • Transverse Magnetic • Transverse Electric								
	5.3 Wave Propagation in Waveguides								
	5.4 Waveguide Current and Mode Excitation								
	5.5 Waveguide Resonators								
	Total								102hr

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	1hr		1hr
2	Test	10%	2hr		2hr
3	Project and Presentation	15%	1hr	8hr	9hr
3	Mid exam	20%	√		3hr
				Total	15hr
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam			3hr		3hr
				Grand Total SLT	120hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face

Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	
		3	Lab view
13	Text book and reference: (note: ensure the latest edition /publication)	1	Textbook: 1. Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University Press,New York, 2001.
		2	Reference: 1. Hayt, W.H., Engineering Electromagnetics, 4th ed., McGraw-Hill, 1981. 2. David J. Griffiths, Introduction to Electrodynamics, 3rd ed., Prentice-Hall, Inc., 1999. 3. Woldegiorgis W/mariam (Prof.), Applied Electromagnetic Fields Waves,

	Adama Science and Technology University		
1	School: Humanities and Social Sciences	Department: Humanities Unit	
2	Course Category	General Requirement	
	Course Name	**Entrepreneurship and Business Development**	
	Course Code:	**SOSC5003**	
3	Synopsis	This interdisciplinary course in general is designed to introduce students to the concept of sustainable entrepreneurship, a manageable process that can be applied across careers and work settings. It focuses on building entrepreneurial attitudes and behaviors that will lead to creative solution within community and organizational environments. This course is designed to prepare individuals for ownership of their own innovative business, and assist start-ups to function more effectively, increase the chances of new business success, enhance profitability, and increase employment. More specifically, the course provides students with an introduction to the concepts and skills necessary to successfully commercialize new products and services. Entrepreneurship is not just about starting a business. It is also about identifying good opportunities and then creating, communicating, and capturing value from those opportunities; including innovation in a corporate context. It will also teach students the skills to analyze business opportunities, and articulate them as a compelling business description, and pitch to an audience of investors, customers, or business partners. It focuses on building entrepreneurial attitudes and behaviors that will lead to creative solution within community and organizational environments.	
4	Name(s) of Academic Staff:		
5	Semester/Year offered:	Semester: I	Year 4
6	Credit Hour:	3	
7	Prerequisite:	None	
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:		
	CLO1	Analyze the concept of entrepreneurship and develop a mindset that would consider entrepreneurship as a possible future career choice.	
	CLO2	Apply the concept of start-up ideas development and feasibility analysis in crafting viable business model that underpins entrepreneurial venture establishment.	
	CLO3	Explain the basic aspects of innovation and its significance role in opportunities recognition and prototype development.	
	CLO4	Explain and analyze start-up precautionary aspects that would further contribute towards creating and growing an entrepreneurial venture.	
	CLO5	Apply the concept of elevator pitch to communicate the value the new venture provides to customers, investors and other stakeholders.	
10	Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:		

Course Learning Outcomes (CLO)	**Student Outcomes (SO)**							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6		L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1								√			√	√						

	CLO2						✓		√			√				√			
	CLO3						✓		√			√				√			
	CLO4						✓		√			√	√						
	CLO5						✓		√			√			√				
	Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box																		

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Critical Thinking/Problem Solving
	2	Organization/Management/Leadership/Decision Making
	3	Communication: Business Idea presentation (Elevator pitch)
	4	Business Management (Finance, Human, Operations, marketing & legal aspects)

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
		L	T	P	O			
Chapter 1: Entrepreneurship: an overview	CLO-1	**8**				**3**	**10**	**21**
1.47. Meaning & Importance of Entrepreneurship	CLO-1	2				-	2	4
1.48. Characteristics of Successful Entrepreneurs	CLO-1	2				1	3	6
1.49. Entrepreneurial Motivation	CLO-1	2				1	3	6
1.4 Understanding an Entrepreneurial Process	CLO-1	2				1	2	5
Chapter 2: Business Idea Generation and Selection	CLO-2 & CLO-5	**8**				**4**	**11**	**23**
Developing start-up ideas	CLO-2	2				2	2	6
Types and Sources of start-up ideas	CLO-2	1				-	2	3
New Product Development (NPD) Process	CLO-2	2				-	2	4
Value Analysis and Reverse Engineering	CLO-2	2				-	3	5
3.6. 2.5 Business Concept Statement	CLO-5	1				2	2	5
Chapter 3: Innovation and Pre Start-up	CLO-2 & CLO-3	**8**				**4**	**11**	**23**
Innovation and its type	CLO-3	2				1	2	5
Market Research (An Overview)	CLO-3	1				-	2	3
Business Model Development (Busin ess Canvas)	CLO-2	3				2	4	9
3.4 Business Planning	CLO-2	2				1	3	6
Chapter 4: Start-up Consideration s	CLO-4	**15**				**4**	**15**	**34**

	Marketing	CLO-4	3				2	3	8
	Marketing Mixes (The 4P's)	CLO-4							
	Marketing Strategies (Targeting, Seg menting, and Positioning)	CLO-4							
	Operations	CLO-4	3				-	3	6
	Operations System	CLO-4							
	Finance	CLO-4	4				2	3	9
	Financing a new venture (Types of fi nance)	CLO-4							
	Sources and Use of Finance	CLO-4							
	Human Resource	CLO-4	2				-	2	4
	HR Planning	CLO-4							
	Employee Handling	CLO-4							
	Legal	CLO-4	3				-	4	7
	Forms of Business Ownership	CLO-4							
	Licensing & Registration	CLO-4							
	Intellectual property (IP) Rights	CLO-4							
								Total	**101hrs.**

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Tests (1 & 2)	10%	√		2
	2	Quiz	10%	√		1
	3	Individual Assignment	10%		√	5
	4	Project (Business Model Development & Presentation)	20%	√	√	6
					Total	14
	Final Exam	Percentage 50 (%)		F2F	NF2F	SLT
	Final Exam	50		√		**5 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12 3.	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Opto Lab
		2	
		3	

13	Text book Reference:	1	Bruce R. Barringer and Duane R. Ireland (2016), Entrepreneurship: Successfully launching new ventures, 5th edition; Pearson education.
		2	Longenecker, et al (2017): Small Business Management: Launching and Growing Entrepreneurial Venture, 18th edition, Cengage Learning.
		3	Hailay Gebretinsae, Entrepreneurship and Small Business Management, 2nd Edition.
		4	Stocks david and Willson Nick (2006), small business management and Entrepreneurship, 6th ed
		5	Coulter, May (2003), Entrepreneurship in action, 2nd ed., Prentice Hall of India,

			New Delhi.
		6	Brychan Thomas, et al (2014): Innovation and Small Business, Volume 1, 1st edition.
		7	Brychan Thomas, et al (2014): Innovation and Small Business, Volume 2, 1st edition.

	Adama Science and Technology University	
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	Engineering Research and Development Methodology
	Course Code:	ECEg-4206
3	Synopsis:	This course introduces different types of Research methods: necessity, types and levels of researches; problem formulation, modeling & experimentation; data collection/generation and processing; Presentation skills: research and project proposals; oral presentations formats; applications of audiovisual equipment; Management aspect of Research and Development (R&D) works and outputs: discussion forums; intellectual property rights; management of R&D works.
4	Staff: Name(s)	
5	Semester and Year offered:	Semester: I Year: IV
6	Credit Hour:	2
7	Prerequisite	Senior standing courses
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Apply current knowledge of quantitative and qualitative methods.
	CLO2	Identify reference and critically review current engineering developments.
	CLO3	Identify and formulate research problem; design and conduct experiments, devise appropriate measurements, analyze and interpret data and form reliable conclusions.
	CLO4	Communicate effectively in oral, written and graphical forms.
	CLO5	Work effectively: demonstrating ethical conduct, adaptability and responsibility.
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Student Outcomes (SO)															
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Presentation	Quiz	Proposal	Mid Exam	Final Exam
CLO1	√	√				√	√	√	√						√	√
CLO2	√							√	√			√		√	√	√

	CLO3	√	√				√	√	√	√					√	√	√
	CLO4		√	√					√	√			√	√	√		√
	CLO5			√	√	√			√	√			√		√		√
	The relevancy between the CLO and SO is indicated by "√" on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Presentation Skills
	2	Data Management
11	Distribution of Student Learning Time (SLT)	

Course Content Outline	CLO	Teaching and Learning Activities						TotalSLT
		Guided Learning (F2F)				Guide Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Introduction**	CLO1	1 hr	1 hr			1hr	1hr	4hr
1.1 Meaning and Objectives of Research								
1.2 Motivation in Research								
1.3 Types of Research								
1.4 Research Methods versus Methodology								
1.5 Research and ScientificMethod								
1.6 Research Process								
1.7 Criteria of Good Research								
Chapter 2: **Literature Review & Technical Reading**	CLO2	2hr	1hr			2hr	5hr	10hr
2.1 Literature search, review and citation practices								
2.2 Technical Reading								
Chapter 3: **Defining Research Problem**	CLO3	1hr	1hr			1hr	1hr	4hr
3.1 What is a Research Problem?								
3.2 Selecting the Problem								
3.3 Necessity of Defining the Problem								
Chapter 4: **Research Design**	CLO3	2hr	2hr			3hr	5hr	12hr
4.1 Meaning of Research Design								
4.2 Need for Research Design								
4.3 Features of a Good Design								

	4.4 Developing a Research Plan								
	Chapter 5: Methods of Data Collection	CLO3	1hr	1hr			1hr	2hr	5hr
	5.1 Collection of Primary Data								
	5.2 Collection of Secondary Data								
	Chapter 6: Processing and Analysis of Data	CLO3 CLO4	2hr	2hr			3hr	5hr	12hr
	6.1 Elements/Types of Analysis								
	6.2 Statistics in Research								
	6.3 Measures of Central Tendency								
	6.4 Measures of Dispersion								
	6.5 Measures of Asymmetry (Skewness)								
	6.6 Measures of Relationship								
	6.7 Simple Regression Analysis								
	6.8 Other Measures								
	Chapter 7: Testing of Hypotheses	CLO4	1hr	1hr			2hr	4hr	8hr
	7.1 What is a Hypothesis?								
	7.2 Procedure for Hypothesis Testing								
	7.3 Different Steps in Writing Report								
	7.4 Layout of the Research Report								
	Chapter 8: Management Aspects of R&D	CLO5	1hr	1hr			2hr	4hr	8hr
	8.1 Intellectual property rights								
	8.2 Management of R&D works								
	Total								63hr

Assessments

	Continuous Assessment	Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5	√		1 hr
2	Test	10		√	4 hr
3	Project + Presentation	15	√		8 hr
4	Mid Exam	20	√		2 hr
	Total				15 hr

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	**50%**	√		2hr
Grand Total SLT				**80 hr**

	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.		
12	Special requirements and resources to deliver course (e.g., software, computer lab, simulation room ...etc.)	1	Presentation Software
		2	Writing Tools
13	Text book & Reference: (Latest edition /publication)	1	C.R Kothari, "**Research Methodology** methods and Techniques", 2 editionPublisher: New Age, 2004
		2	Kenneth S. Bordens and Bruce B. Abbott, "**Research Design and Methods AProcess Approach**"

	Adama Science and Technology University															
1	College: **COEEC**							Department: **EPCE**								
2	Course Category	Major Elective														
	Course Name	Introduction to Power Systems														
	Course Code:	EPCE 4309														
3	Synopsis	The course deals with the following major points: - Introduces Fundamentals of power systems, Representation of power system components, Electrical design of transmission line, Mechanical design of transmission lines, Characteristic and performance of power transmission lines, Corona, Overhead line insulators, Underground cables.														
4	Name(s) of Academic Staff:															
5	Semester/Year offered:	Semester:	I	Year	4											
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)														
7	Prerequisite:	EPCE2101														
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:															
	CLO1	Discuss fundamentals of power systems and modelling its components for power transmission.														
	CLO2	Analyze power transmission systems representations and calculation of transmission line parameters.														
	CLO3	Apply Electrical and mechanical design considerations to installation of overhead transmission lines.														
	CLO4	Discuss performance analysis of transmission lines, cable and overhead line insulators.														
9	Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:															
	Course Learning Outcomes (CLO)	**Student Outcomes (SO)**														
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods	Assessment						
										Test	Quiz	Assig nmen	Proje	Lab	Mid exam	Final exam

									L	T	P	O							
	CLO1	√		-	-	-			√	√	√	-	-	-	√	-	-	√	√
	CLO2	-	√	-	-	√	√	√	√	√	√	-	√	-	√	-	√	√	√
	CLO3	√	√	-	-	√	√	√	√	√	√	√	√	-	√	-	√	-	√
	CLO4	-	√	-	-	√	√	√	√	√	√	√	-	-	√	-	√	-	√
	Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box																		

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB software
	2	Powerworld software Usage

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Fundamentals of power systems	CLO1	4	3	1		1	-	9 hrs.
1.1. Defination of power system 1.1.1. Historical development of power system 1.1.2. Analysis of poly phase circuit (balanced and unbalanced three phase concetion) 1.1.3. Source of energy 1.50. 1.1.4. Basic structure of power system								
1.51. AC and DC transmission								
1.52. Single-phase and three-phase transmission								
Chapter Two: Representation of Power System Components	CLO2	4	6	3		2	2	17hrs.
2.1 Single-phase solution of balanced three-phase networks								
2.1.One-line diagram Impedance or reactance diagram								
2.11. Complex Power								
2.12. Per unit (PU) system								
Chapter Three: 2.13. **Electrical Design of Overhead Lines**	CLO3	6	9	6		3	4	28hrs.
2.14. Constants of transmission line								
2.15. Resistance of transmission lines								

	Skin and proximity effect								
	Transposition of transmission line								
	3.1. Inductance 3.1.1. Inductance of single-phase two-wire line 3.1.2. Inductance of 3-phase line with symmetrical and unsymmetrical spaced transmission line Inductance of composite conductors								
	Concept of self-GMD and Mutual-GMD								
	Inductance formulation in terms of GMD								
	Capacitance of single phase two wire transmission line								
	Capacitance of 3-phase overhead line with symmetrical and unsymmetrical spaced lines								
	Chapter Four: Mechanical Design of Overhead Lines	CLO3	4	5	5		2	2	18hrs.
	Sag, span and tension calculations								
	Effect of wind and ice								
	Stringing chart								
	Sag template								
	Chapter Five: Performance of transmission lines	CLO4	4	5	6		2	2	19hrs.
	5.1. Introduction 5.1.1. Efficiency of transmission line Voltage regulation of transmission line								
	Representation of transmission lines								
	Short transmission line								
	Medium transmission line								
	Long transmission line								
	ABCD Constants								
	Ferranti Effect								
								Total	**91 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	10	√		2hrs.
2	Assignments	5		√	10hrs.

	3	Lab report	15	√	√	12hrs.
	4	Mid exam	20	√		2hr.
					Total	**25hr**
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		1	Computer Lab		
			2	Laboratory		
			3			

13	Text book	1	D. Das Electrical Power Systems, New Age International (P) Ltd Publishers, 2006.
	Reference:	1	V.K Mehta, Rohit Mehta, Principles Of Power System, S. Chad &company pvt.ltd ,Revised Edition ,2015
		2	C. L. Wadhwa, Electrical Power Systems, New Age International Publishers, 2004
		3	Syed Nasar, Electrical Power Systems (Schaum‟s Outline Series), McGraw-hill Publishing Company,
		4	W. D. Stevenson, J.J. Grainger, Power System Analysis McGraw-Hill, New Delhi, 1994.
		5	Dr. George G. Karady, Dr. Keith E. Holbert, Electrical Energy Conversion and Transport: An Interactive Computer-Based Approach, Wiley-IEEE Press, 2005.
		6	J. D. Glover and M. S. Sarma, Power System Analysis and Design, Brooks/Cole, Third Edition.

	Adama Science and Technology University				
1	College: **COEEC**		Department: **EPCE**		
2	Course Category	Major Mandatory			
	Course Name	**Electrical Measurement and Instrumentation**			
	Course Code:	EPCE3207			
3	Synopsis	The course deals with the following major points: - basic concepts of Electrical measurement and instrumentation, instrumentation type and performance characteristics (static and dynamic), basic concepts of sensors and their application, calibration of measuring sensors and instruments, general principles of signal conditioning and conversion, signal processing elements, output presentation element and design some simple Measurement systems using different sensors, actuators and semiconductors.			
4	Name(s) of Academic Staff:				
5	Semester/Year offered:	Semester:	I	Year	3
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)			
7	Prerequisite:	ECEg2202			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Discuss basic concept, type and component of Electrical Instrumentation and Measurement (like how to use the measuring Instrument and measure various physical quantities with accuracy, precision, resolution in the real system)			
	CLO2	Discuss different elements of Measurement system (Input elements (sensor), signal			

		conditioning elements, signal processing elements & output presenting elements)
	CLO3	Compute about signal conditioning and conversion systems to various instrumentation and measuring systems
	CLO4	Analyze about various signal processing methods of instrumentation and measuring system
	CLO5	Analyze and design the output presentation elements of instrumentation and measuring system
	CLO6	Design some simple instrumentation and measuring system (electrical meters, bridges, oscillators, amplifiers etc)

9 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)																	
								Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√	-	-	-	-	√	√	√	-	√	-	√	-	-	-	√	√	√
CLO2	√	-	-	-	-	√	√	√	-	√	-	√	-	√	-	√	√	√
CLO3	√	-	-	-	-	√	√	√	-	√	-	-	-	-	-	√	√	√
CLO4	-	√	√			√	√	√	-	√	-	√	-	√	-	√	-	√
CLO5	√	√	-	-	-	√	√	√	-	√	-	-	-	√	-	√	-	√
CLO6	-	√	√	√	√	√	√	√	-	√	-	-	-	-	-	√	-	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1 Setting up laboratory experiments of electrical machines and analysis of test results

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Principles of Measurement	CLO1 CLO4	6		3			3	12hr
1.1. Introduction 1.2. Standards of measurement 1.3. Electrical measuring devices 1.4. Measurement system 1.5. Performance characteristics 1.5.1. Static characteristics 1.5.2. Dynamic characteristics 1.6. Noise and Interference 1.53.								
Chapter Two: 1.54. **Sensors and transducers Technology**	CLO2	8		6		3	4	21hr
2.1 Introduction 2.2 Sensor classification								

	2.2.1. Based on physical effect 2.2.2. Based on energy source 2.2.3. Based on physical quantity conversion 2.3 Application of sensor 2.4 Actuators 1.55. Transducer								
	Chapter Three: 1.56. **Signal conditioning, Converting & Interfacing elements**	CLO3 CLO5	6		6			3	15hr
	3.1. Introduction 3.1.1. AC and DC bridge Circuit 3.1.2. Amplifiers 3.1.3. Operational amplifiers 3.1.4. Instrumentation amplifiers 3.1.5. Oscillators 3.1.6. Filter 3.2. ADC and DAC Converting Element 1.57. Interfacing circuits								
	Chapter Four: **Signal Processing**	CLO2	6		3		3		12hr
	4.1. Data acquisition system and data logging 4.1.1. Introduction 4.1.2.Computer and data acquisition system 2.16. Data logging								
	Chapter Five: 2.17. **Output Representation**	CLO6	6		3		3	3	15hr
	5.1 Introduction 5.2 Display/indicting 5.2.1. Pointer & scale instruments 5.2.2.Digital/Alphanumerical instruments 5.2.3. Graphical instruments 5.3 Recording 5.1.1. Chart/graphical recorders 5.1.2. Magnetic tape recorders 5.4 Display instruments 5.1.1. LCD 2.18. LED								
	Chapter Six: 2.19. **Design of meters**	CLO6	6		4		4	3	17hr
	6.1. Ammeter design 6.1.1. Range extension of ammeter 6.2. Voltmeter design 6.2.1. Range extension of								

	voltmeter **2.20.**								
								Total	**92 hrs.**

Assessment						
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	10	√		1hr
2	Assignments	10	√	√	10hr
3	Lab report	10	√	√	12hr
4	Mid exam	20	√		2hr
				Total	**25hr**
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Instrumentation Lab
		2	MATLAB Software
		3	Computer Lab
13	Text book	1	Prithwiraj Purkait, Electrical and Electronics Measurements and Instrumentation
	Reference:	1	John P. Bentley, principles of measurement system, third edition
		2	Robert B. Northrop, Introduction to instrumentation and measurements, 3rd edition
		3	Alan S. Morris and Reza Langari, Measurement and Instrumentation, theory and practice
		4	William C. Dunn, Introduction to instrumentation, sensors, and process control

Adama Science and Technology University		
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	Microprocessor and Interfacing
	Course Code:	ECEg4202
3	Synopsis:	The Microprocessor and interfacing course intends in getting the concepts to the mastering of basic microprocessors and microcomputers. The discussion of the course will be based around the 8086 Intel microprocessor and selected advanced microprocessors and microcontrollers. However, this is not stiff and could be subjected to change. The fact that the 8086 is the considered basic processor architecture, make the discussion be based on the microprocessors. The discussion of the course will begin by introducing the microcontroller evolution in their historical background. The course will describe and explain the detailed architecture of the processor. Bus, memory, IO, and registers will be highly focused. The assembly language code will be studied, and different programs will be attempted. The most important discussion will be the interfacing of different types of devices and ICs to the microprocessor. This will help students in equipping them with appropriate knowledge in helping them to develop solutions to real world problems. Interfacing of interrupts, IO modules and other important concepts will

		be examined.
4	Name(s) of Academic Staff:	TA
5	Semester and Year offered:	Semester: II Year: IV
6	Credit Hour:	4
7	Prerequisite/ Co-requisite: (if any)	ECEg4201: Computer Architecture and Organization
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	

CLO1	Discuss about microcomputers and internal architecture of a microprocessor
CLO2	Develop efficient codes in both assembly and high-level languages and analyze interrupts
CLO3	Understand the assembly language programming and the instruction set
CLO4	Analyze different types of interfacing devices
CLO5	Design controllers and computers using advanced microprocessor

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Quiz	Laboratory	Mid exam	Design project	Final Exam
CLO1	√							√	√				√	√		√
CLO2			√					√	√	√			√	√	√	√
CLO3	√							√		√			√	√	√	√
CLO4			√				√	√		√		√	√		√	√
CLO5	√					√		√		√			√		√	√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)

1	8086 Emulator Software
2	
3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
		Guided learning (F2F)	Guided Learning (NF2F)	Independent Learning (NF2F)	

			L	T	P	O			
	CHAPTER 1: INTRODUCTION TO MICROCOMPUTERS	CLO1	1hr	1 hr			1hr	2hr	5hr
	Evolution of Microcomputers								
	Application Areas								
	Introduction to microprocessors								
	CHAPTER 2: 8086 MICROPROCESSOR - ARCHITECTURE	CLO2	4hr		4hr		5hr	7hr	20hr
	2.1 Register and Memory Organization								
	2.2 Minimum Mode and Maximum Mode bus cycle-Timing Diagram								
	2.3 Interrupts & Service Routine.								
	CHAPTER 3: PROGRAMMING OF 8086	CLO3	5hr	6 hr	6hr		8hr	11hr	36hr
	3.1 Addressing modes								
	3.2 Instruction set								
	3.3 Assembly language Programming								
	CHAPTER 4: INTERFACING WITH 8086	CLO4	4hr	4 hr	6hr		8hr	11hr	33hr
	4.1 Memory interfacing								
	4.2. Interfacing with peripheral ICs 8251- serial I/O								
	4.3. 8255-parallel I/O								
	4. 8254-programmable interval timer								
	4.5. 8279-Keyboard display controller								
	4.6. 8257-DMA								
	4.7. LEDS and LCDs								
	4.8. ADCs and DACs								
	CHAPTER 5: ADVANCED MICROPROCESSORS & MICROCONTROLLERS	CLO5	6hr		8hr		9hr	17hr	40hr
	5.1 Advanced Microprocessor Architecture Pentium								

	5.2 Concept of CISC and RISC processors							
	5.3 Introduction to ARM processor and PIC microcontroller.							
	5.4 Controller and Computer Design using selected Microprocessor							
	Total							134hr

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5	√		1hr
2	Lab	10	√		1.5hr
4	Project +Presentation	15	√		2 hr.
5	Mid Exam	20		√	21.5 hr.
Total					26hr
Final Exam	Percentage 50(%)		F2F	NF2F	SLT
Final Exam			√		3hr
Grand Total SLT					160hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	8086 emulator Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	DoughlasV.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012..
		2	Ramesh S Gaonkar, 'Microprocessor Programming and Interfacing using 8085', Penram Publications, 4th Edition, 2003
		3	A.K.Ray, K.M.Bhurchandy, 'Intel Microprocessors-Architecture, Programming and Interfacing', McGraw-Hill International Edition, 2004
		4	Microprocessors and Interfacing, first Edition, 2009. A.P Douglas and D.A Douglas
		5	Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family –Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
		6	Douglas V Hall, 'Microprocessors and Interfacing-Programming and Hardware', 2nd Edition, Tata McGraw-Hill Publishing Company Limited, NewDelhi-2002.
		7	M. Rafi Quazzaman, "Microprocessors Theory and Applications: Intel and Motorola", : Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

<table>
<tr><td colspan="7">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="3">College: CoEEC</td><td colspan="3">Department: ECE</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="5">Major Mandatory</td></tr>
<tr><td>Course Name</td><td colspan="5">Antenna and Radio Wave Propagation</td></tr>
<tr><td>Course Code:</td><td colspan="5">ECEg4204</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">This course initially describes the Radiation Integrals and Auxiliary Potential Functions. This leads to the development of various types of antennas and their applications in various types of communication systems. Then a detailed characteristic aspect of antennas are described as Antenna Parameters: Radiation Resistance, Radiation Pattern, Radiation Intensity, Directive Gain and Directivity, Power Gain. Later on, this course gives a detailed classification of various types of antennas in different frequency bands as; Wire Antennas: Antenna Types; Hertzian Dipole; Half-Wave Dipole Antenna; Quarter-Wave Monopole Antenna; Small Loop Antenna. Aperture Antennas, Frequency Independent Antennas, Broadband Antennas and Planar Antennas, Antenna Arrays: Two Element Array; N- Element Linear Array; Broadside Array; Ordinary End-Fire Array; Phased (Scanning) Array; Hansen-Woodyard End-Fire Array. This course also describes about the smart antennas required for the future generation wireless mobile communication systems where the signal processing techniques are combined along with array antennas: Beam Shaping Techniques Multi-beam antennas, active antennas, efficient adaptive array control algorithms. This course finally describes about the various problems associated with signal propagating through the wireless channels (both fixed and mobile) as; Radio Wave Propagation: Ground Wave Propagation; Space Wave Propagation; Line of Sight Propagation; Ionospheric Propagation; Noise. The related research areas include Log-Periodic Antennas, Fractal Antenna, Microstrip Antennas, Rectangular Patch & Circular Patch Antenna, Antenna Arrays, Ridge Antennas, the current and future generation wireless communication systems, and the medical industry.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5"></td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>II</td><td>Year:</td><td>IV</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">3</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">ECEg4205 EM Waves and Guide Structure</td></tr>
<tr><td rowspan="3">8</td><td colspan="6">Course Learning Outcome (CLO): At the end of the course the student will be able to:</td></tr>
<tr><td>CLO1</td><td colspan="5">Analyze the antenna design parameters and field evaluation under various conditions and formulate the electric as well as the magnetic fields Equation set for Far field and near field conditions.</td></tr>
<tr><td>CLO2</td><td colspan="5">Discuss the Array system of different antennas and field analysis under application of</td></tr>
</table>

		different currents to the individual antenna elements.
	CLO3	Interpret operations of fundamental antennas like patch antennas, Yagi-Huda antennas, Horn antennas and helical structure and also their operation methodology in practice.
	CLO4	Design a lens structure and also the bench step for antenna parameter measurement of testing for their effectiveness.
	CLO5	Characterize about the means of propagation of Electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (PLO)															
								Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Lab	Quiz	Project	Mid Exam	Final Exam
CLO1	√							√		√			√	√	√	√
CLO2	√							√		√		√		√	√	√
CLO3	√							√		√		√		√	√	√
CLO4		√	√					√		√		√		√		√
CLO5	√		√					√		√		√		√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB Software / Antenna Design Software (PUFF)
2	Microwave Test Bench (L, S, C, X, K Bands)
3	Network and Spectrum Analyzer (0 Hz – 100 GHz)

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
CHAPTER 1: **INTRODUCTION TO ANTENNA RADIATION MECHANISM**	CLO1	4 hr				3hr	3hr	5hr
1.1 Introduction								
1.2 Radiation Mechanisms								
1.3 Types of Antennas								

	1.4 Current Distribution on thin Wire Antenna								
	1.5 Radiation Integrals and Auxiliary Potential Functions								
	1.6 Solution of the inhomogeneous vector potential wave equation								
	1.7 Far-Field Radiations								
	1.8 Duality Theorem								
	CHAPTER 2: **FUNDAMENTAL PARAMETERS OF ANTENNAS**	CLO1	4hr				2hr	4hr	10hr
	2.1 Radiation Pattern								
	2.2 Radiation Power Density and Radiation Intensity								
	2.3 Beam solid angle								
	2.4 Directivity and Gain								
	2.5 Beamwidth and Radiation Efficiency								
	2.6 Polarization								
	2.7 Impedance								
	2.8 Reciprocity Theorem								
	2.9 Effective Aperture and Temperature								
	CHAPTER 3: **LINEAR WIRE AND LOOP ANTENNAS**	CLO2	6hr		4hr		3hr	7hr	20hr
	3.1 Introduction								
	3.2 Modeling								
	3.3 Design Techniques and Procedures								
	3.4 Types and Applications: Wire antennas: Short dipole, Radiation resistance and Directivity,								
	3.5 Half wave Dipole, Monopole,								
	3.6 Small loop antennas: square and circular								
	CHAPTER 4: **ANTENNA ARRAYS**	CLO3	6hr	--	3hr	----	4hr	7hr	20hr

	4.1 Antenna Arrays: Linear Array and Pattern Multiplication								
	4.2 Two-element Array, Uniform Array, Polynomial representation								
	4.3 Array with non-uniform Excitation-Binomial Array								
	4.4 Antenna Arrays Two Element Array; N- Element Linear Array; Broadside Array; Ordinary End-Fire Array								
	4.5 Phased (Scanning) Array								
	4.6 Beam Shaping Techniques								
	4.7 Multi-beam antennas								
	CHAPTER 5: **ANTENNA STRUCTURES**	CLO3	4 hr	--	2 hr	----	4hr	10hr	20hr
	5.1 Yagi-Uda Antenna								
	5.2 Slot antenna								
	5.3 Horn Antenna,								
	5.4 Reflector Antennas								
	5.5 Lens Antennas								
	5.6 Planar Antennas								
	5.7 Frequency Independent Antennas								
	Chapter 6: **ANTENNA MEASUREMENTS**	CLO4	2 hr	---	2 hr	-----	1hr	5hr	10hr
	6.1 Radiation Pattern measurement								
	6.2 Amplitude and Phase Measurement								
	6.3 Gain (2 and 3 antenna methods) and Directivity Measurement								
	6.4 Impedance and Polarization Measurement								
	6.5 Antenna Range Design and Evaluation								
	6.6 Anechoic Chamber measurement								
	CHAPTER 7: **RADIO WAVE PROPAGATIONS**	CLO5	3 h		2 h		1hr	4hr	10hr

			r		r				
	7.1 Frii’s Free Space Propagation								
	7.2 Ground Wave Propagation								
	7.3 Ground Reflection, Surface waves, Diffraction								
	7.4 Atmospheric Propagation and Scattering								
	7.5 Tropospheric Propagation and Tropospheric Scatter								
	7.6 Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere, Effects of earth’s magnetic fields, Faraday rotation, Whistlers.								
	7.7 Space Waves Propagation								
	7.8 Path Loss, Shadowing and Wireless Fading								
	7.9 EMI/EMC (Interference and Compatibility)								
	7.10 LOS Microwave Propagation Systems and Link Design								
	Total								95hr

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz 1	5	√		1hr
2	Lab	10		√	6hr
3	Project + Presentation	15	√		2hr
4	Mid Exam	20		√	8hr
Total					20hr
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam			√		3hr
Grand Total SLT					120hr

	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.		
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	Network/Spectrum Analyzer
		3	Computer Lab
		4	Software (PUFF)
		5	Workshop-Microwave Test Bench
13	Text book and reference: (note: ensure the latest edition /publication)	1	J. D. Kraus, "*Antennas and Wave Propagation*", McGraw-Hill, 4th ed., 2010.
		2	E.C. Jordan and K. G. Balmain, "*Electromagnetic Waves and Radiating Systems*", PHI, 2nd ed., 2000.
		3	C. A. Balanis, "*Antenna Theory*", John Wiley & Sons, 3rd ed., 2005
		4	F. E. Terman, "*Electronic and Radio Engineering*", McGraw-Hill, 4th ed., 1955.
		5	Warren L. Stutzman and Gary A. Thiele, "*Antenna Theory and Design*", John Wiley & Sons, Inc.
		6	Thomas A. Millgan, "*Modern Antenna Design*", McGraw-Hill Ltd, 3rd Edition.
		7	Chand L. Godara, "*Smart Antennas*", CRC Press.
		8	Christopher Haslett, "*Essentials of Radio Wave Propagation*", Cambridge University Press.
		9	H. Sizun, "*Radio Wave Propagation for Telecommunication Applications*", Springer-Verlag Berlin Heidelberg, 2005
		10	John A. Richards, "*Radio Wave Propagation*", 2008 Springer-Verlag Berlin Heidelberg
		11	Les Barclay, "*Propagation of Radio Waves*", Institution of Engineers, 2003
		12	R. E. Collins, "*Antennas and Radio Wave Propagation*", McGraw Hill, 1985.

	Adama Science and Technology University	
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	Data Communication and Computer Networks
	Course Code:	ECEg-4208
3	Synopsis:	This is a senior level undergraduate course for students who wish to gain a broad understanding of data communications, communication networks and Internet protocols. Students are expected to have a basic knowledge data transmissions and digital communications. There will be several real-life projects related to data communications and students will use software for implementation or simulation.

		These projects complement the theoretical aspects and have considerable pedagogic value in helping students understand concepts and design.
4	Staff: Name(s)	
5	Semester and Year offered:	Semester: II Year: IV
6	Credit Hour:	3
7	Prerequisite	ECEg-4203 Digital Communication.
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Classify the division of network functionalities into layers
	CLO2	Analyze the components of a data communication interface and relate it to a specific interfacestandard;
	CLO3	Identify several codes and apply the error detection and correction techniques in data communication
	CLO4	Analyze the routers and their configuration, static routing and IPv6 configuration
	CLO5	Analyze features, services and operations of various transport/ application layer protocols
	CLO6	Understand the Infrastructure and various issues in LAN and WAN networks

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)							Teachin g Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	laboratory	Quiz	Project	Mid Exam	Final Exam
CLO1	√							√						√	√	√
CLO2	√							√				√		√	√	√
CLO3	√	√					√	√				√		√	√	√
CLO4		√				√	√	√	√				√	√		√
CLO5	√	√				√	√	√	√					√		√
CLO6	√	√					√	√	√					√		√

The relevancy between the CLO and SO is indicated by "√" on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Cisco Packet Tracer

	2	Wireshark
	3	GNS3

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						TotalSLT
			Guided Learning (F2F)				Guide Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: **Introduction**	CLO1	2hr		3hr		1hr	2hr	8hr
	1.1 Overview of Data Communications & Networks								
	1.2 Basic concepts in Data Communication & Networking								
	1.3 Layering Concept-communication Network Architectures								
	1.4 OSI layers and TCP/IP models								
	Chapter 2: **Physical Layer**	CLO2	4		9		2hr	3hr	18hr
	2.1 Analog and DigitalSignals								
	2.2 Data Rate Limits								
	2.3 TransmissionImpairment								
	2.4 Signal Encoding Techniques								
	2.5 Physical Layer Devices								
	2.6 Digital Transmission								
	Chapter 3: **Data Link Layer**	CLO3	4hr		6hr		2hr	4hr	16hr
	3.1 Data Link Frames								
	3.2 Error Detection andCorrection								
	3.3 Media Access Control								
	3.4 Multiple Access Protocol (MAP)								
	3.5 MAC Address Forwarding Mechanisms								
	4.6 Data Link Layer Protocols								
	Chapter 4: **Network Layer**	CLO4	8rh		9hr		2hr	5hr	24hr
	4.1 Internetworking								
	4.2 IPv4/ IPv6 Address								
	4.3 Protocols: ARP/RARP/ICMP/ IGMP								

	4.4 Classful/Classless Addressing								
	4.5 IPv4 Subnetting								
	Chapter 5: Transport and Application Layer	CLO5	8 hr		12 hr		2hr	4hr	26hr
	5.1 Transport Layer Protocols								
	5.2 TCP congestion Control and Flow Control Techniques								
	5.3 RTP/RTCP/ Socket Addressing								
	5.4 Client Server Model & Domain Name System (DNS)								
	5.5 Dynamic Host Configuration Protocol (DHCP)								
	5.6 HTTP/HTTPS/SSL/TLS								
	5.7 Secure Shell/Telnet								
	5.8 FTP/SFTP								
	Chapter 6: LAN and WAN Networks	CLO6	6		6		1hr	3hr	16hr
	6.1 Local area Networks								
	6.2 Layer 2/Layer 3 Switches								
	6.3 WAN architectures								
	6.4 Routers and Routing Protocols								
							Total		108 hr

Assessments

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	1hr		1hr
2	Lab	10%	3hr		3hr
3	Project/Presentation	15%	3		3hr
4	Mid exam	20%	2hr		2hr
				Total	9hr

Final Exam	Percentage 50(%)	F2F	NF2F	SLT
Final Exam	**50%**	3hr		3 hr
			Grand Total SLT	**120 hr**

L = Lecture, T = Tutorial, P = Practical, O = Others,
F2F = Face to Face, NF2F = Non-Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver course (e.g., software, computerlab, simulation room …etc.)	1	Cisco Packet Tracer
		2	Wireshark, GNS3
		3	Computer lab

13	Text book & Reference: (Latest edition /publication)	1	Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw-Hill
		2	S. Tannenbaum, D. Wetherall, Computer Networks, Prentice Hall, Imprint of Pearson 5th edition
		3	William Stallings: Data & Computer Communications
		4	Larry L. Peterson and Bruce S. Davie: Computer Networks
		5	Rita Puzˇmanová: Routing and Switching

Adama Science and Technology University						
1	School: Humanities and Social Sciences			Department: Humanities Unit		
2	Course Category	**General Course**				
	Course Name	**Introduction to Economics**				
	Course Code:	**SOSC2002**				
3	Synopsis:	This course provides a general introduction to economics combining elements of micro and macro fundamentals. The main objective of this course is to introduce and acquaint students with the preliminary principles (theories) and knowledge of economics and the application of economic theories (principles) in the actual world; the daily activities of the households, firm business or any other form of enterprises at micro levels. Students will also able to contextualize the key macroeconomic variables and policy instruments. Specifically, the course introduces students with theory of consumer behavior, production, and cost of production. In these theories how decisions are made by different economic agents will be discussed. Furthermore, the course covers different characteristics of perfect and imperfect market structure. Lastly the course tries to introduce basic macroeconomic concepts such as national income accounting, unemployment, inflation, fiscal and monetary policy instruments				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	2	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	N0				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO -1	Describe the major economic units constituting a given society and their corresponding roles
	CLO -2	Explain the objective functions of consumers and how they attain this objective under resource constraints
	CLO -3	Define producers' objective functions, describe their cost structures in the short and the long run, and apply partial equilibrium approaches to find optimal prices and quantities under different degrees of competition.
	CLO -4	Tabulate markets into different categories on the basis of the number of buyers and sellers and outline the various social welfare implications of each market structure.
	CLO -5	Understand how aggregate economic measures are constructed, their weaknesses, and alternative measures of national wellbeing

	CLO-6	Identify the sources and adverse effects of economic crises and describe the pool of policy instruments that can be deployed to mitigate the consequences of these crises.

Course Learning Outcomes	Students Outcome (SO)										Assessment				
	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6	Teaching Methods				Test	Quiz	Assignment	Project	Lab-report
							L	T	P	O					
CLO-1				√			√				√				
CLO-2				√			√				√				
CLO-3				√			√				√				
CLO-4					√		√				√				
CLO-5					√		√					√			
CLO-6					√		√						√		

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	
2	
3	

]1 1 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 0: Introduction	1	**3h**				**1h**	**2h**	**6h**
0.1. Definition and meaning of economics	1	30 m				10m	20m	1h
0.2. Opportunity and accounting costs	1	1h				10m	20m	1h &30m
0.3. Induction and deduction in economics	1	20 m				10m	20m	50m
0.4. Partial and general equilibrium analysis	1	20 m				10m	20m	50m
0.5. The economic circular flow model and production possibilities frontier	1	30 m				20m	40m	1h&30m
0.6. Economic systems		20 m					30m	20m
Chapter 1: Theory of Consumer Behaviour and Demand	2	**9h**				**4h**	**8h**	**21h**
1.1. Theory of demand and Supply	2	2h				1h	2h	5h
1.2. Theory of Consumer Behaviour	2	2h				40m	1h	3h&40m

	1.3 The ordinal utility approach	2	3h				1h	2h	6h
	1.4 The budget line	2	30 m				20m	1h	1h&50m
	1.5 Optimum of the consumer	2	30 m				30m	1h	2h
	1.6. Elasticity of demand	2	1h				30m	1h	2h&30m
	Chapter 2 : Theory of Production	3	**6h**				**2h**	**3h**	**11**
	2 .1 Production function	3	2h				30m	20m	2h&50m
	2.2. Short run Production Function	3	2h				1h	2h	5h
	2.3. Long Run Production Function	3	2h				30m	40m	3h&10m
	Chapter 3: Theory of Costs	3	**3h**				**2h**	**3h**	**8h**
	3.1. Definition and types of costs	3	30 m				20m	20m	1h&10m
	3.2 Short-run costs	3	30 m				20m	1h	1h&50m
	3.3 Long-run costs.	3	30 m				20m	30m	1h&20m
	3.4 Relationship between short run cost and production curves	3	30 m				20m	30m	1h&20m
	3.5 Derivation of cost functions from production functions	3	30 m				20m	20m	1h&10m
	3.6 Dynamic changes in costs- the learning curve	3	30 m				20m	20m	1h&10m
	Chapter 4: Perfect Competition Market	4	**4h**				**3h**	**3h**	**10h**
	4.1 Assumptions of perfect competitive market	4	1h				20m	30m	1h&50m
	4.2 .Demand and revenue function in Perfectly competitive market	4	30 m				1h	1h	2h&30m
	4.3 Competitive markets, short- run equilibrium of the firm, industry, and market	4	1h& 30 m				1h	1h	3h&30m
	4.4 The long-run equilibrium of the firm, industry and market	4	1h				40m	30m	2h&10m
	Chapter 5: Pure Monopoly Market	4	**3h**				**3h**	**3h**	**9h**
	5.1 Characteristics and source of monopoly	4	30 m				20m	20m	1h&10m
	5.2 Short run and long-run equilibrium	4	1h				1h	1h	3h
	5.3 Price discrimination	4	50 m				50m	50m	2h & 30m
	5.4 Multi-plant monopolist	4	40 m				50m	50m	2h&20m
	Chapter Six: Monopolistic Competition	4	**3h**				**2h**	**3h**	**8h**
	6.1. Assumptions	4	30 m				20m	30m	1h&20m
	6.2. Product differentiation, the demand curve and cost of the firm	4	1h				40m	1h	2h&40m
	6.3. The concept of industry and	4	30				20m	30m	1h&20m

	product 'group'		m						
	6.4 Short-run and long-run equilibrium of the firm excess capacity and welfare loss	4	1h				40m	1h	2h&40m
	Chapter 7: Fundamentals of macroeconomics	5	**8h**				**3h**	**9h**	**20h**
	Chapter 7: Fundamentals of macroeconomics	5	40 m				30m	1h	2h&10m
	7.1.The concepts of GDP and GNP	5	1h				30m	2h	3h&30m
	7.2.Approaches of measuring national income (GDP/GNP)	5	1h				30	1h	2h&30m
	7.3. Other social accounts (GNP, NNP, NI, PI and DI)	5	40 m				10m	30m	1h&20m
	7.4.Nominal versus real GDP	5	40 m				20	1h	2h
	7.5. The GDP deflator and the consumer price index	5	1h				10m	30m	1h&40m
	7.6. GDP and welfare	5	1h				15m	1h	2h&15m
	7.7. The business cycle	5	1h				20m	1h	2h&20m
	7.8. Unemployment and inflation	6	1h				15m	1h	2h&15m
	Total		**39h**				**20h**	**34h**	**93h**

	Assessment					
	Continuous Assessment		Percentage - 50(%)	F2F	NF2F	SLT
	1	Quizzes	10	3h		3h
	2	Group Assignments	10		7h	7h
		Individual Assignments	10		8h	8h
	3	Mid Exam	20	3h		3h
					Total	**21h**
	Final Exam		Percentage-50 (%)	F2F	NF2F	
	Final Exam		50	6h		6h
					Grand Total	**120 hrs**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9. Note h= hour/hours and m=minutes					
13	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)					

14	Text book and reference: (note: ensure the latest edition /publication)	1	Acemoglu, D., Laibson, D., & List, J.,(2018). *Economics*, 2nd Edition, Boston: Pearson Education.
		2	C.L.Cole, Micro Economics: year... A Contemporary Approach.
		3	D.N.Dwivedi, 1997, Micro Economic Theory, 3rdEd., Vikas Publishing
		4	Ferguson & Gould's, 1989, Microeconomic Theory, 6thEd.
		5	Hal R. Varian, Intermediate Microeconomics: A Modern Approach, 6thEd.
		6	Hubbard, G., & O'Brien, A.,(2019). *Economics*, 7th Edition, Boston: Pearson Education.
		7	Koutsoyiannis, Modern Microeconomics, edition ...., year…
		8	Krugman, P., Wells, R.,& Graddy, K.,(2016). *Essentials of Economics*, 4th Edition, New York: Worth Publishers
		9	Mankiw, G., (2018). *Principles of Economics*, 8th Edition, Boston:
		10	N.Gregory Mankiw, 2007, Macroeconomics 4thedition
		11	O'Sullivan, A., Sheffrin, S., & Perez, S.,(2017). *Economics: Principles, Applications, and Tools*, 8th Edition, Boston: PearsonEducation
		12	O'Sullivan, A.,Sheffrin, S.,& Perez, S., (2019). Survey of Economics: Principles, Applications, and Tools, 8th Edition, Boston: Pearson Education.
		13	Parkin, M., (2019). *Economics*, 13th Edition, Boston: Pearson Education.
		14	R.S. Pindyck& D.L. Rubinfeld, 2013, Microeconomics, 8 th edition
		15	Samuelson, P., &Nordhaus, W.,(2009). *Economics*, 19thEdition, Boston: McGraw-Hill Higher Education.

Adama Science and Technology University					
1	College: **CoEEC**		Department: **ECE**		
2	Course Category	Major (Mandatory)			
	Course Name	**Integrated Engineering Team Project**			
	Course Code:	IETP4202			
3	Name(s) of Academic Staff:				
4	Semester and Year offered:	Semester:	II	Year:	4
5	Credit Hour:	3 (1hr Lecture, 0hr Tutorial and 6hr Laboratory)			
6	Prerequisite/Co-requisite:	-----			
7	Course rationale	This course helps students undertake engineering projects, particularly in multidisciplinary teams. The course assists students in developing comprehensive plans for the technical, operational, and project dimensions of enterprise engineering, as well as designing, communication, report writing, presentations, and entrepreneurship skills. Students will also acquire practical experience in engineering systems and project management planning by integrating their knowledge, skills, and attitude.			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Apply engineering knowledge and the proper design process to produce a creative and innovative solution.			
	CLO2	Develop prototype for the chosen integrated engineering project.			
	CLO3	Internalize the principle of project management and team sprit			
	CLO4	Demonstrate effective communication, report writing and presentation			
9	Mapping of the Course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:				
		Student Outcomes (SO)			
					Assessment

									Teaching Methods				Test	Quiz	Project	Report
									L	T	P	O				
	CLO1		√						√		√	√			√	√
	CLO2		√						√		√	√			√	√
	CLO3					√			√			√			√	√
	CLO4			√					√		√	√			√	√

10	Transferable Skills (if applicable)	
	1	Students will acquire skill of work planning, organizing, coordinating and controlling of projects
	2	Students will develop skills of integrating components into a comprehensive working system.
	3	Students will acquire skill of teamwork, good communication, and project management
	4	Students will have skill of analyzing engineering problems, performing engineering design enhancing software related skills.
	5	Students will have skill of transferring engineering projects in to business.
11	Course Synopsis:	This is an integrated, multidisciplinary engineering project aiming to address a special engineering topic that is being guided by a faculty member. The literature review, design, project management, business perception, multidisciplinary teamwork, entrepreneurship are all included in the team project.

12 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F to F)				Guided Learning (NF to F)	Independent Learning (NF to F)	
		L	T	P	O			
Introduction • Overview about integrated and multidisciplinary Project • Team work • Overview of project management • Entrepreneurship, Business Plan, Cash Flow, Contracting works, marketing strategy.	CLO3	2				3	3	8
Project proposal • Literature review • Problem identification • Development of methods • Project budget plan • Project work plan	CLO1 CLO4	2		3		2	15	22
Project planning and Design • Technical Design ✓ Material selection ✓ Drawing and specification ✓ Engineering codes and standards • Economic analysis	CLO1 CLO2 CLO3 CLO4	10		50		7	8	75

	• Component assembly and prototype (Simulation) development • Prototype testing • Results and discussions • Product/process operational manuals									
									Total	**105**
	Assessment									
	Assessment		Percentage Total-100(%)			F to F		NF to F		
	1	Project Proposal Document	10			0		2 (preparation)		2
	2	Project Proposal oral presentation	10			1		1 (preparation)		2
	3	Project progress report	10			1		2 (preparation)		3
	4	Poster Evaluation	5					2 (preparation)		2
	5	Prototype Evaluation	30			1				1
	6	Project report evaluation	20					2 (preparation)		2
	7	Oral Presentation Evaluation	10			1		1 (preparation)		2
	8	Peer Evaluation	5			1				1
									Sub-Total	**15**
									Grand Total SLT	**120**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F to F = Face to Face, NF to F = Non Face to Face									
13	Special requirements and resources to deliver the course		• Workshop and laboratory is required for project work (product development, device manufacturing/assembly etc.) • Software, computer and simulation room is needed to simulate and design. • Industry visit							
14	Text book and reference:		• Relevant books, research Journal articles, workshop and conference papers related to the project topic. • Integrated Engineering Team project guideline.							

	Adama Science and Technology University		
1	College: CoEEC		Department: ECE
2	Course Category	Major Restrictive Elective	
	Course Name	**Microwave Devices and Systems**	
	Course Code:	ECEg-4310	
3	Synopsis	Review of Smith Chart applications: impedance, susceptance, VSWR calculations, quarter wave impedance transformer, the slotted line impedance finder. Microwave Network Analysis: impedance matrix, susceptance matrix, hybrid matrix, ABCD matrix, scattering parameters, signal flow graphs. Matching Networks and Tuning: Impedance matching RLC networks, Microstrip matching networks, Single Stub Tuning. Amplified design considerations; stability considerations, power gain considerations, amplifier tuning. Oscillator Design; oscillation conditions, oscillator configurations	

4	Name(s) of Academic Staff:				
5	Semester/Year offered:	Semester:	II	Year	4
6	Credit Hour:	3			
7	Prerequisite:	EM Waves and Guide Structures:ECEg4205			
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Apply Smith chart use for solution of transmission line problems and impedance matching.			
	CLO2	Analyze microwave networks using impedance, admittance, transmission and scattering matrix representations.			
	CLO3	Design microwave matching networks using L section, single and double stub and quarter wave transformer.			
	CLO4	Describe, analyze and design basic passive and active microwave circuits such as couplers, amplifiers, mixers, oscillators.			
	CLO5	To improve skills in written communication, through a laboratory and project reports.			

10 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√							√		√		√				√	√	√
CLO2	√							√		√			√	√	√	√	√	√
CLO3		√						√		√			√	√	√	√		√
CLO4						√		√		√		√	√	√	√	√		√
CLO5							√	√						√	√			√

Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1. [Microwave Office | AWR Software]

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F) L	T	P	O	Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
Chapter 1: **Introduction**	CLO1	2hr	-	2hr		2hr	4hr	10hrs
1.58. 1.1 Microwave frequencies								
1.2 Review of the Smith Chart • Input impedance/susceptance • Reflection coefficient								

1.59. VSWR								
1.60. 1.3 Rectangular Wave Guides								
1.4 Wave guide transmission modes • TE • TM • TEM and Hybrid Modes								5
Chapter 2: **Microwave Network Analysis**	CLO2	5hr				4hr	6hr	15hrs
2.1 Impedance admittance Matrices								
2.2 Scattering Matrix								
2.3 Transmission Matrix								
2.4 Signal Flow Graphs								
Chapter 3: 3.7. **Matching Networks and Tuning**	COL3	6hr	-	5hr	-	4hr	10hr	25hr
3.1 L-Match Impedance Matching Networks								
3.2 Pi and T Impedance Matching Networks								
3.3 Microstrip Matching Networks								
3.4 Single Stub Tuning								
Chapter 4: **Noise and Microwave Amplifier Design**	CLO4	8hr		6hr	4hr	6hr	6hr	30hr
Noise in microwave circuits								
Noise Figure Calculation								
4.3 Two port Power gains								
Stability considerations								
Low noise amplifier design								
Amplifier Tuning								
Chapter 5: **Microwave Transistor Oscillator Design**	CLO5	6hr	-	4hr	4hr	3hr	3hr	20hr
5.1 Oscillation conditions • Feedback Oscillators One-Port Negative Resistance Oscillators								
5.2 Two Port Negative Resistance Oscillators								
5.3 Oscillator Configurations								
							Total	**100hrs.**
Assessment								
Continuous Assessment	Percentage Total-50(%)					F2F	NF2F	SLT

	1	Quiz	5	1hr		1hr
	2	Lab	10	3hr	3hr	6hrs
	3	Project + Presentation	15	1hr	7hr	8hrs
	4	Mid Exam	20	2hr		2 hrs
					Total	17
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)		1	Microwave Work Bench		
			2	Micwave Office| AWR Software		
4.			3			
13	Text book Reference:	1	Microwave Transistor Amplifiers Analysis and Design, Second Edition, Guillermo Gonzalez.			
		2	Microwave Engineering, Fourth Edition, David M. Pozar.			
		3	Microwave Devices and Circuits, Third Edition, Samuel Y. Liao.			

Adama Science and Technology University						
1	College: CoEEC			Department: ECE		
2	Course Category	Major Elective				
	Course Name	Integrated Circuit Technology				
	Course Code:	ECEg-4312				
3	Synopsis:	In this course, students will study wide range of IC technology fabrication process, IC technology industrial machines and tools. Course covers various internal elements manufacturing methods and models. With this course student will able to understand the vital concepts of IC manufacturing process.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	IV	Year:	II	
6	Credit Hour:	3				
7	Prerequisite / Co-requisite: (if any)	Microelectronic devices & circuits (ECEg-306)				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Examine the approaches of Crystal Growth fabrication and silicon wafers properties.				
	CLO2	Investigate the various epitaxial methods and advantages of epitaxial over the conventional methods				

	CLO3	Understand the lithography process: drawing of circuits on wafer and also analyses the etching techniques
	CLO4	Describe the different deposition methods in IC fabrication using chemical or vapor depositions
	CLO5	Evaluate the IC thermal oxidation and Dopant-Diffusion manufacture and measurement methods.
	CLO6	Analyze the dominant and preferred method for doping and growing of metallization layers in silicon wafers in IC manufacturing.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Project	Mid Exam	Final Exam
CLO1	√					√	√	√	√					√	√	√
CLO2			√				√	√	√			√		√	√	√
CLO3	√					√		√	√				√	√	√	√
CLO4							√	√	√			√		√		√
CLO5					√			√	√			√		√		√
CLO6			√			√	√	√	√					√		√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Semiconductor fabrication methods
2	
3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
<u>Chapter 1 Introduction and Crystal Wafer growth</u>	CLO 1	4 hr	2 hr			2hr	5hr	13hr
1.1 Integrated Circuits? Types of Integrated Circuits.								
1.2 Complexity of ICs Desig								

	n								
	1.3 Hierarchical and CAD design: Integrated Circuit Components and Structures								
	1.4 Crystal Lattice, MGS and EGS, Crystal Defects and Czochralski Crystal Gro wth								
	1.5 Silicon Shaping and and processing consideratio n								
	1.6 Oxygen and carbon cont amination in wafer								
	Chapter 2 Epitaxy	CLO 2	6 hr	4 hr			2hr	5hr	17 hr
	2.1 Epitaxy, Types of epitaxies: Homo, Hetero								
	2.2 Advantages of Epitaxy								
	2.3 General Epitaxial Deposition Requirements								
	2.4 Chemical Vapor Deposition								
	2.5 Types of reactors in CVD Devices								
	2.6 Molecular Beam Epitaxy								
	2.7 Liquid phase epitaxy & Solid Phase Epitaxy								
	Chapter 3 Lithography and etching	CLO 3	6 hr	3 hr			3hr	5hr	17 hr
	3.1 Lithography: Introduction								
	3.2 Photoresist types and difference								
	3.3 Lithography process								
	3.4 Optical lithography								
	3.5 Exposure Methods (Point, proximity and projection								
	3.6 Introduction to Etching								
	3.7 Wet Etching and Dry etching								
	Chapter 4 Deposition,	CLO 4	6 hr	3 hr			4hr	5hr	18 hr

4.1 Deposition: Introduction								
4.2 Chemical Vapor Deposition								
4.3 Physical Vapor deposition								
4.4 Sputtering and Evaporation								
4.5 Difference between Evaporation and Sputtering								
<u>Chapter 5 Oxidation</u>	CLO 5	4 hr	2 hr			4hr	5hr	15 hr
5.1 Oxidation								
5.2 Need of Oxidation								
5.3 Growth Mechanism								
5.4 Oxide Properties								
5.5 Dry Oxidation								
5.6 Wet Oxidation								
Chapter 6 Diffusion, Ion Implantation and CMOS Fabrication	CLO 6	4 hr	2 hr			4hr	5hr	15 hr
6.1 Diffusion theory								
6.2 Flicks law of Diffusion								
6.3 Ion Implantation								
6.4 Difference between Ion implantation and diffusion								
6.5 Metallization								
Total								95 hr

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Quiz 1	5	1hr		1hr
2	Test	10	3hr	5hr	8hr
3	Project + Presentation	15	1hr	10hr	11hr
4	Mid Exam	20	2hr		2hr
Total					22 hr
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	3hr		3 hr
Grand Total SLT					120 hr

	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.		
12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	The instructor should select the appropriate tool and simulations models
		2	
		3	
		4	
		5	Choose an item.
13	Textbook and reference: (note: ensure the latest edition /publication)	1	James D.Plummer, Michel D.Deal and Peter B.Griffin, "Silicon VLSI Technology, Fundamentals, Practice and Modeling", Prentice Hall, 2000.
		2	NEIL H.E.WESTE, "CMOS VLSI Design A circuit and Systems Perspective".Addison-Wesley,4th Edition, 2011.

	Adama Science and Technology University					
1	College: SOEEC		Department: ECE			
2	Course Category	Major Elective				
	Course Name	**Industry Internship-II**				
	Course Code:	ECEg4200				
3	Synopsis:	Advance Practical Expertise: Build on foundational skills from Industrial Internship I by engaging in more complex and high-impact engineering tasks. The course Deepen Technical Proficiency by Developing expertise in advanced technologies and methodologies relevant to the student's field. Enhance Project Management: Strengthen skills in managing substantial engineering projects, including strategic planning, execution, and evaluation.Refine Problem-Solving and Innovation: Tackle advanced engineering problems with innovative solutions and strategic thinking. Cultivate Professional Skills: Further develop professional competencies, including leadership, advanced communication, and strategic thinking. Strengthen Industry-Academia Ties: Enhance collaboration between academic learning and industry practices through involvement in significant projects.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	IV	Year	3	
6	Credit Hour:	3				
7	Prerequisite:	All Previous major courses				
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Demonstrate an advanced understanding of the host company's technological and organizational structure, including recent developments and innovations.				
	CLO2	Lead and contribute to high-impact engineering projects, utilizing sophisticated tools and methodologies.				
	CLO3	Design, implement, and evaluate complex engineering systems, integrating theoretical				

		knowledge with advanced practical applications.
	CLO4	Apply advanced problem-solving techniques to resolve intricate technical challenges and develop innovative solutions.
	CLO5	Produce a detailed final report that captures advanced technical tasks, strategic solutions, and significant contributions made during the internship.
10	Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:	

Course Learning Outcomes (CLO)	Student Outcomes (SO)														
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment			
								L	T	P	O	Advisor evaluation & Paper writing	Host Company evaluation	p Document ion	presentatio n
CLO1	✓	✓	✓	✓	✓	✓	✓			√		√	√	√	√
CLO2	✓	✓	✓	✓	✓	✓	✓			√		√	√	√	√
CLO3	✓	✓	✓	✓	✓	✓	✓			√		√	√	√	√
CLO4	✓	✓	✓	✓	✓	✓	✓			√		√	√	√	√
CLO5	✓	✓	✓	✓	✓	✓	✓			√		√	√	√	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Team work

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter one: INTRODUCTION TO INDUSTRIAL INTERNSHIP II	CLO1	-	-	4hr	-	-	-	4hr
1 Course Overview: 1.2 Objectives of Industrial Internship II: 1.3 Benefits of Advanced Industry Collaboration								
Chapter two HOST COMPANY ANALYSIS	CLO2	-	-	4hr	-	-	-	4hr
2.1 Company Profile and Recent Developments: 2.2 Organizational Structure and Recent Changes: 1.61. 2.3 Advanced Technological and Technical Structures:								
Chapter Three: PROBLEM FORMULATION	CLO3	-	-	20 hr	-	-	-	20hr
3.1 Identification of Complex Problems:								

	3.2 Contextual Analysis of Problems: 3.3 Advanced Problem-Solving Techniques: 3.4 Strategic Problem Analysis: 3.5 Developing Strategic Proposals:								
	Chapter four: PROJECT DEVELOPMENT AND IMPLEMENTATION	CLO4	-	-	36 hr	-	-	-	36hr
	44.1 Project Planning and Design: 4.2 Advanced Development Techniques: 4.3 Project Implementation: 4.4 Monitoring and Evaluation: 4.4 Advanced Solution Development:								
	Chapter five: CONCLUSION AND RECOMMENDATIONS	CLO5	-	-	28 hr	-	-	-	28hr
	5.1 Final Report Preparation: 5.2 Presentation of Findings and Strategic Recommendations: 5.3 Conclusion and Future Directions:								
								Total	92 hrs.

	Assessment				
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Advisor evaluation & Paper writing	20	√		**20hr**
	2	Host Company evaluation	25	√		**97hr**
					Total	117hr
	Final Exam		Percentage 55 (%)	F2F	NF2F	SLT
	Documents and presentation		55	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Simulation Room
		2	Different practical implementation lab
		3	Manuals
13	Text book/ Reference:	1	Adama Science and Technology University: Internship Guidline
		2	Different text book and references according to their needs.

	Adama Science and Technology University		
1	College: Electrical Engineering and Computing		Department: Electronics and Communication Eng.
2	Course Category	Major Mandatory	
	Course Name	Wireless and Mobile Communication	

	Course Code:	ECEg5201				
3	Synopsis:	Introduction of wireless and mobile communication systems: History of mobile radio communication, examples of wireless communications (Zigbee, Bluetooth, and Internet of Things), and trends in cellular radio communication systems (1G to 6G mobile networks). Evolution of mobile telephony system: introduction mobile telephony system, GSM mobile telephony system, UMTS/WCDMA mobile telephony system, LTE mobile network, "5G mobile networks". Cellular Concept and System Design Fundamentals: Cellular Concept & Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Services. Mobile Radio Channel Modeling & Mitigations: Wireless Channel Models and Signal Propagations, Small Scale Fading and Multipath propagation, Mitigation Techniques for Fading Wireless Channels, Equalization Techniques, Diversity Techniques, Coding Techniques. Multiple Access Techniques for Wireless Systems: Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access, Space Division Multiple Access, Spread Spectrum Multiple Access, OFDMA wideband systems.				
4	Name(s) of Academic Staff:	TBA				
5	Semester and Year offered:	Semester:	I	Year:	V	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	ECEg4203-Digital Communication				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Analyze wireless communications system and network performance.				
	CLO2	Evaluate the measures to increase the capacity in GSM, WCDMA and LTE systems-Sectorization and Spatial Filtering for Interference Reduction				
	CLO3	Identify the effects of shadowing, path loss, and fading on performance.				
	CLO4	Design cellular systems to achieve coverage area, spectrum allocation and quality of service specifications.				
	CLO5	Analyze the different wireless multiple access techniques, path loss models, wireless sensors networks and cooperative diversity networks.				
9	Mapping of the course Learning Outcomes to the Student Learning Outcomes, Teaching Methods and Assessment:					
	Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)				

	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P		Lab	Quiz	Project	Mid exam	Final exam
CLO1	√							√						√	√	√
CLO2	√	√						√				√		√	√	√
CLO3	√	√						√				√	√	√	√	√
CLO4			√			√		√				√		√		√
CLO5		√					√	√		√		√		√		√

Indicate the relevancy between the CLO and SO by ticking “√”on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Wireless Systems Design Skills
2	Wireless Systems Architecture Analysis Skills
3	4G/LTE/5G Standard Selection Skills

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Introduction of Wireless and Mobile Communication**	CLO1	4hr				2hr	4hr	10hr
1.1 History of Mobile Radio C ommunication								
1.2 Examples of newly emerging Wireless Communication Technologies								
1.3 Internet of Things								
1.4 Trends in Cellular Radio Communication Systems								
Chapter 2: **Evolution of mobile telephony system**	CLO2	6hr				2hr	4hr	12hr
2.1 Introduction mobile								

	telephony system								
	2.2 GSM mobile telephony system and details of the architecture								
	2.3 UMTS/WCDMA mobile telephony system details of the architecture								
	2.4 LTE Mobile networks details of the architecture								
	2.5 5G Mobile networks details of the architecture								
	Chapter 3: **Cellular Concept and System Design Fundamentals**	CLO3	6hr				6hr	4hr	16hr
	3.1 Cellular Concept & Frequency Reuse								
	3.2 Channel Assignment Strategies								
	3.3 Handoff Strategies Equalization Techniques								
	3.4 Interference and System Capacity Diversity Techniques								
	3.5 Trunking and Grade of Services Coding Techniques								
	Chapter 4: **Mobile Radio Channel Modeling & Mitigations:**	CLO4	8hr				8hr	8hr	24hr
	4.1 Small Scale Fading and Multipath Propagation Concepts								
	4.2. Parameters of the Mobile Radio Channel								
	4.3 Impulse Response Model of the Wireless Channel								
	4.4 Categorization of the Fading Channel								
	4.5 Mitigation Techniques for Fading Wireless Channels								
	Chapter 5: **Multiple Access Techniques for Wireless Systems**	CLO5	8hr				8hr	8hr	24hr
	5.1 Frequency Division								

	Multiple Access								
	5.2 Time Division Multiple Access								
	5.3 Code Division Multiple Access								
	5.4 Space Division Multiple Access								
	5.5 Orthogonal frequency Division Multiple Access								
	Total								84hr

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5	√		1hr
2	Lab	10	√		18hr
3	Project and Presentation	15		√	12hr
4	Mid exam	20	√		2hr
				Total	33hr
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		3hr
				Grand Total SLT	120hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer lab
		2	MATLAB
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Wireless communications principles and practice, Theodore S.Rappaport, 2nd edition.
		2	Wireless communications, Andrea goldsmith, Cambridge university press,2005
		3	Mobile cellular telecommunications, William C.Y.Lee 3rd edition
		4	Mobile communications, Lochen H.schiller, Addison Wesely,2nd edition,2003

	Adama Science and Technology University	
1	College: CoEEC	Department: ECE
2	Course Category	Major Mandatory
	Course Name	**Capstone Project**
	Course Code:	EPCE5205

3	Synopsis	The aim of the capstone project in the senior (final) year of Electrical Power and Control Engineering majors is to familiarize them with the process of designing electrical power and control systems as practiced in industry. This course requires students to develop a project based on the knowledge and skills acquired in earlier coursework and integrate their technical knowledge through practical design effort.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	I	Year	5	
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)				
7	Prerequisite:	Senior Standing				

9 Course Learning Outcome (CLO): At the end of the course the student will be able to:

CLO1	Apply the knowledge and skills acquired throughout their academic program to develop innovative solutions to real-world problems.
CLO2	Conduct thorough research, analyze data, and synthesize information to inform their Capstone project.
CLO3	Demonstrate project management skills, including planning, organizing, and executing a comprehensive project plan.
CLO4	Communicate effectively through written and oral presentations, showcasing their Capstone project findings and recommendations.
CLO5	Reflect on their learning experience and evaluate their personal and professional growth throughout the Capstone project.

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Progress report	Oral presentation
CLO1	√	√	√	√	√	√	√			√							√	√
CLO2	√	√	√	√	√	√	√			√							√	√
CLO3	√	√	√	√	√	√	√			√							√	√
CLO4	√	√	√	√	√	√	√			√							√	√
CLO5	√	√	√	√	√	√	√			√							√	√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1	Setting up laboratory experiments of electrical machines and analysis of test results

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Capstone Project	CLO1 -			√			√	

		CLO5							
	1.62. Each design team is required to select its own project proposal. Students are strongly encouraged to select projects that involve hardware and software design. At the completion of a project, a demonstration of a hardware prototype, and a detailed design report that clearly documents all aspects of the design process need to be provided. The final design project report must also address issues, as appropriate, that are related to manufacturability, engineering economics, environmental, as well as ethical issues.								
	Total								.

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Advisor evaluation & Paper writing	40	√	√	78hr
	Total					25hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final design project oral presentation		60	√		**2hrs.**
	Grand Total SLT					**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Different Software
		2	Computer Lab
5.		3	Different practical implementation lab
13	Text book/ Reference:	1	Different text book and references according to their Capstone project titles.

Adama Science and Technology University		
1	College: COEEC	Department: ECE
2	Course Category	Major (Mandatory)
	Course Name	Final Year Project Phase I
	Course Code:	ECE5207
3	Name(s) of	To be assigned

	Academic Staff:				
4	Semester and Year offered:	Semester:	I	Year:	5
5	Credit Hour:	2			
6	Prerequisite/ Co-requisite: (if any)	Accomplishmentof all major courses			
7	Course rationale				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Identify engineering problem and gather relevant information from various scientific literature.
	CLO2	Formulate a hypothesis and conduct preliminary experimental investigations.
	CLO3	Develop and adapt the appropriate experimental methodologies through the use of different tools such as design expert, simulation and design software and other computational tools.
	CLO4	Write the research proposal following standard proposal writing formats and present it in clear and understandable way.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)															
								Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Quiz/test	Assignment	Project	Progress report	Oral presentation
															√	√
CLO1	√									√					√	√
CLO2	√					√				√					√	√
CLO3						√				√					√	√
CLO4			√							√					√	√

10	Transferable Skills (if applicable)	
	1	Students will acquire a practical skill of identifying real world problems and provide appropriate justifications for the solution.
	2	Students will acquire skills of designing experimental setups and conducting experiment.
	3	Students will acquire skills of executing independent task, managing research project and effective communication.
11	Course Synopsis:	This phase one (I) final year project, led by a faculty member, focuses on individual research on chemical engineering problems. It includes literature review, problem identification, seminar presentation, preliminary research work, interim report, proposal development, and proposal presentation for projects involving component, product, and system design and development.
12	Distribution of Student Learning Time (SLT)	

		Teaching and Learning Activities	Total (SLT)

	Course Content Outline/project activity	CLO	Guided learning (F to F)				Guided Learning (NF to F)	Independent Learning (NF to F)	
			L	T	P	O			
	Introduction • Overview on project proposal development and research writing. • Orientation on the procedures of Phase I final year Project.		4	0	0	0	0	2	6
	Problem identification, literature review		0	0	0	0	5	10	15
	Preliminary research work		0	0	0	0	3	12	15
	Proposal development		0	0	0	0	5	25	30
	Total		4	0	0	0	13	49	66

	Assessment					
	Continuous Assessment		Percentage Total-100(%)	F to F	NF to F	SLT
	1	Interim Reports	20	1	4 (preparation)	6
	2	Seminars	30	2	3 (preparation)	5
	3	Proposal defense	50	1	2 (preparation)	3
	Total					14
	Grand Total SLT					80
	L = Lecture, T = Tutorial, P = Practical, O = Others, F to F = Face to Face, NF to F = Non Face to Face					

13	Special requirements and resources to deliver the course.	1	➢ Workshop and laboratory is required for project work ➢ Software, computer and simulation room is needed to simulate and design project works.
14	Text book and reference:	1	• Relevant books, research Journal articles, workshop and conference papers related to the ongoing research problem areas. • Faculty members • ASTU's Senior project guideline

Adama Science and Technology University		
1	College: CoEEC	Department: ECE
2	Course Category	Major Elective
	Course Name	VLSI Design

<table>
<tr><td></td><td>Course Code:</td><td colspan="5">ECEg5307</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">Very Large-Scale Integrated Circuits (VLSI) have become the prime medium of realization of modern Electronics Systems. The main objective of this course is the study of MOSFETs and their fabrication techniques in order to design various combinational and sequential circuits using CMOS Logic. This course also introduces the concepts and techniques of modern integrated circuit design and analysis along with optimization of combinational and sequential circuit using static and dynamic based CMOS Circuits. This course is one of the vital courses for designing the processors and verifications.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5">TBA</td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>I</td><td>Year:</td><td>V</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">3</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">Digital Logic Design (ECEg3201)</td></tr>
</table>

<table>
<tr><td>8</td><td colspan="2">Course Learning Outcome (CLO): At the end of the course the student will be able to do:</td></tr>
<tr><td></td><td>CLO1</td><td>Model combinational and sequential digital circuits using VHDL Programming.</td></tr>
<tr><td></td><td>CLO2</td><td>Discuss VLSI design flow, design styles and the fabrication processes of MOS</td></tr>
<tr><td></td><td>CLO3</td><td>Analyze the operation of Metal oxide field effect transistor and understand the behavior of the circuit with respect to aspect ratio and designs.</td></tr>
<tr><td></td><td>CLO4</td><td>Design and analyze the static and dynamic behavior of MOS Inverter circuits.</td></tr>
<tr><td></td><td>CLO5</td><td>Design CMOS based combinational and sequential logic circuits at transistor level.</td></tr>
<tr><td></td><td>CLO6</td><td>Design and Analysis of Pass transistor and transmission gate-based circuits</td></tr>
</table>

<table>
<tr><td></td><td colspan="10">Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:</td></tr>
<tr><td></td><td rowspan="2">Course Learning</td><td colspan="9">Student Outcomes (SO)</td></tr>
<tr><td></td><td>SO1</td><td>SO2</td><td>SO3</td><td>SO4</td><td>SO5</td><td>SO6</td><td>SO7</td><td></td><td>Assessment</td></tr>
</table>

9									Teaching Methods				Lab	Quiz	Project presentation	Mid Exam	Final Exam
									L	T	P	O					
	CLO1	√				√		√	√		√		√		√	√	√
	CLO2			√					√		√		√		√	√	√
	CLO3	√				√	√		√		√		√	√	√		√
	CLO4								√		√		√		√		√
	CLO5	√	√					√	√		√		√		√		√
	CLO6						√	√					√				
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Xilinx
	2	HDL Language
	3	Digital Design

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **VHDL Basics**	CLO1	4hr		6hr		1hr	6hr	17hr
1.1 Introduction to VHDL								

	1.2 Library Declaration, VHDL basics, Syntax, Keywords,								
	1.3 Data types and objects								
	1.4 Basic operations and expressions								
	1.5 Entities and chitectures								
	Chapter2: **VHDL Modelling**	CLO1	4hr		6hr		2hr	6hr	18hr
	2.1 Structure of basic VHDL program								
	2.2 Dataflow Modelling								
	2.3 Structural Modelling								
	2.4 Behavioral Modelling								
	2.5 Testbenches and simulation model								
	Chapter 3: **MOS Transistor**	CLO2	6 hr				2 hr	7 hr	15 hr
	3.1 Historical Perspective, VLSI Design Flow and Y-Chart								
	3.2 VLSI Design styles, Standard cell-based design, FPGA								
	3.3 Introduction, Fabrication processes, NMOS Fabrication, CMOS Fabrication								
	3.4 MOS Structure, operation and I-V characteristics								
	3.5 MOS Scaling and small								

	geometry effects								
	Chapter 4: **MOS Inverters**	CLO3 and CLO4	8 hr		4 hr		2 hr	6 hr	20 hr
	4.1 Ideal Inverter and its transfer characteristics,								
	4.2 Noise Immunity and noise margin								
	4.3 Resistive load inverter,								
	4.4 NMOS enhancement inverters								
	4.5 CMOS Inverters, Ideal Inverters								
	Chapter 5: **MOS Logic Design**	CLO4 and CLO5	4hr				3 hr	8 hr	15 hr
	5..1 CMOS Logic circuits								
	5.2 Pass transistor Logic								
	5.3 CMOS Transmission gates								
	5.4 Clocked latch and flip - flop circuits								
	Chapter 6: **Dynamic Logic Circuits**	CLO4 and CLO5	4 hr				3 hr	8 hr	15 hr
	6.1 Clocking methods								
	6.2 Dynamic CMOS circuits								
	6.3 DOMINO and NORA								
	Total								100hr
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Quiz	5	1hr		1hr
	2	Project Presentation	10	1hr	7hr	8hr
	3	Mid exam	20	2hr		2hr
	4	Lab	15	3hr	3hr	6hr
	Total					17 hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			3hr		3hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Xilinx KIT
		2	HDL software
		3	Computer Lab
		4	Choose an item.
		5	Choose an item.
13	Textbook and reference: (note: ensure the latest edition /publication)	1	CMOS Digital Integrated Circuits Analysis and Design", Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill, Third Edition, 2003
		2	A VHDL Primer", Jayaram Bhasker, Pearson Education, 3rdEdition,2005
		3	"CMOS VLSI Design: A Circuits and Systems", Neil H.E.Weste, David Harris, Ayan Banerjee, Pearson Publication,3rd Edition, 2011.
		4	Introduction to VLSI Circuits and Systems", John P.Uyemera,Wiley India, 1st Edition, 2008.
		5	Digital VLSI Design", Ajay Kumar Singh, Eastern Economy Edition, 1st Edition, 2011.
			"Digital Integrated Circuits – A Design Perspective", Jan M. Rabaey,

			Anantha Chandrakasan, Borijove Nikolic, 2nd Edition, Pearson Education, 2003.

	Adama Science and Technology University	
1	**College : CoEEC**	**DEPARTMENT: CSE**
2	**Course Category:**	MAJOR ELECTIVE
	Course Title:	ADVANCED COMPUTER NETWORKING
	Course Code:	CSEg5307
3	Synopsis	This course covers latest trends in the various layers of computer networking, emerging networking technologies and network security. At the end of this course, Students will be able to design and implement networking protocols and equipment.
4	Name(s) of Academic Staff:	
5	Semester/Year offered:	Semester: II Year 5
6	Credit Hour:	3
7	Prerequisite:	ECEg4208
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Analyze the various applications running in the network, set of requirements for network design, network architectures that guides the design and implementation of networks, network programming interface, and various factors that impact network performance.
	CLO2	Differentiate the various solutions for encoding, framing, error detection, error correction, and media access control in different real world technologies. Also differentiate between switching mechanisms in a switched local area networks which uses different technologies. Implement switching algorithms
	CLO3	Compare and contrast the network data plane and control plane to implement an software defined network(SDN). Argue how the introduction of hierarchy, and expanding the address space tackle the issue of network scalability. Weigh how multicast routing and the introduction of multiprotocol label swithcing(MPLS) improves the internet capability.
	CLO4	Select transport algorithms in the context of different required services (simple demultiplexing service, a reliable byte-stream service, a request/reply service, and a service for real-time applications.). Support alternative transport protocols such as QUIC.
	CLO5	Judge the best places to implement congestion control in the network under different resource allocation scheme.
	CLO6	Defend why security functionality is needed to be provided in all the layers of the network. Experiment securing network applications, TCP connections, network layer and wireless LANS.
9	Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:	

Learning Outcomes	Student Outcomes (SO)									
	SO 1	SO 2	SO 3	SO 4	SO 5	SO 6	SO 7	SO 8	Teaching	Assessment

											Methods				Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
											L	T	P	O							
	CLO1	√						√	√		√	√				√	√	√			
	CLO2	√		√	√	√		√			√	√			√		√	√			
	CLO3	√		√	√	√		√	√		√	√			√		√	√		√	
	CLO4	√		√	√	√		√	√		√				√	√	√	√			
	CLO5	√		√	√	√		√	√		√	√			√		√	√			
	CLO6	√		√	√	√		√	√		√	√			√		√	√			√
	Indicate the relevancy between the CLO and PO by ticking “√”on the appropriate relevant box																				
10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)																				

11	**Distribution of Student Learning Time (SLT)**								
	Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	Total (SLT)
			L	T	P	O			
	1. Chapter One: Introduction	1	2		3		3	2	10Hrs
	1.1. Internet Applications								
	1.2. Network Requirements								
	1.3. Network Architecture								
	1.4. Network Programming Interface								
	1.5. Network Performance								
	2. Chapter Two: The Link Layer and LANS	2	4		6		5	5	20Hrs
	2.1. Bit Encoding								
	2.2. Bit Framing								
	2.3. Error Detection and Correction								
	2.4. Multiple Access Links and Protocols								
	2.5.Wireless Networks								
	2.6. Switched Local Area Networks								
	3. Chapter Three: Advanced Internetworking	3	4		6		5	5	20Hrs
	3.1. The Network layer Control Plane and Data Plane								
	3.2. SDN								
	3.3. IPV6								
	3.4. Multicast								
	3.5. Multiprotocol Label Switching (MPLS)								

	3.6. Routing in Mobile Devices								
	4. Chapter Four : Transport	4	4		6		5	5	20Hrs
	4.1. Simple Demultiplexor(UDP)								
	4.2. Reliable Byte Stream(TCP)								
	4.3. Remote Procedure Call								
	4.4. Real Time Transport (RTP)								
	5. Chapter One: Congestion Control and Resource Allocation	5	4		6		5	5	20Hrs
	5.1. Issues in Resource Allocation								
	5.2. Queuing Disciplines								
	5.3. TCP Congestion Control								
	5.4. Advanced Congestion Control								
	5.5.Quality of Service								
	6. Chapter One: Network Security	6	8		9		7	8	30Hrs
	6.1. Principles of Cryptography								
	6.2. Message Integrity and Digital Signatures								
	6.3. End-point Authentication								
	6.4.Securing E-Mail								
	6.5. Securing TCP Connections: SSL								
	6.6. Network-Layer Security: IPSec and Virtual Private Networks								
	6.7. Securing Wireless LANS								
	6.8. Operational Security: Firewalls and Intrusion Detection Systems								
								Total	**120 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Assignment	15%		30Hrs	30Hrs
2	Labreport in Groups	15%	36Hrs		36Hrs
3	Project (Group Based)	15%		15Hrs	15Hrs
4	Mid Exam	20%	3Hrs		3Hrs
				Total	
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		50	3	7	10
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	computer lab
		2	Software: Wireshark, Mininet, NS3, GNS3
		3	Visit: Ethio Telecom

13	Text book and Reference:	1	Computer Networks: A System Approach (Peterson and Davie) https://github.com/SystemsApproach/SystemsApproach.github.io
		2	Computer Networking: A TOP-DOWN APPROACH (Kurose and Ross), Seventh Edition
		3	Computer Networks 5th By Andrew S. Tanenbaum
		4	Larry L. Peterson, Bruce S. Davie, 2021, “Computer Networks: A Systems Approach”, 6th edition, Elsevier/Morgan Kaufmann.
		5	Behrouz A. Forouzan, 2017, "DATA Communications and Networking”, McGraw-Hill Education, 5th edition

	Adama Science and Technology University					
1	College: CoEEC		Department: ECE			
2	Course Category	Major Elective				
	Course Name	Embedded and real-time systems				
	Course Code:	ECEg5315				
3	Synopsis	This course is designed to provide students a working knowledge of embedded systems and its application to the modern technology. In this course the fundamentals of embedded systems, hardware and firmware designs will be explored. Different types of microcontrollers commonly used in the world today will be introduced. The student can have the choice on which microcontrollers that can be used for specific design. Embedded programs using assembly language and higher programming language will be used in the program. Real-time operating systems, low power computing, interfacing as well as optimization are the core topics to be discussed in designing embedded systems.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	5	
6	Credit Hour:	3				
7	Prerequisite:	Microprocessor & Interfacing -ECEg4202				

9	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Discuses and explain on the role ofembedded systems in real world
	CLO2	Be able to discuss on concepts, components both hardware and software ofembedded systems
	CLO3	Write software programs for small to medium scale embedded systems
	CLO4	Design and development processes ofembedded systems
	CLO5	Discuss and compare different types ofreal-time operating system

10 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	**Student Outcomes (SO)**																	
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment						
								L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam

	CLO1	√							√							√	√	√	√
	CLO2	√							√		√					√	√	√	√
	CLO3		√						√		√			√		√	√	√	√
	CLO4					√			√			√				√	√		√
	CLO5	√							√			√				√	√		√
	Indicate the relevancy between the CLO and PO by ticking "√" on the appropriate relevant box																		
10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)																		
	1	Microwave Office | AWR Software																	

11	**Distribution of Student Learning Time (SLT)**								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Introduction	CLO1	4hr				2hr	2hr	8hr
	1.1 What is Embedded System?								
	1.2 Common embedded systems								
	1.3 Contrast between embedded systems and other computer systems								
	1.4 Role and purpose of embedded systems								
	Chapter 2: Embedded Microcontrollers	CLO2	8hr		4hr		5hr	5hr	22hr
	2.1 Structure of a basic computer system								
	2.2 CPU families used in microcontrollers								
	2.3 Basic I/O devices and technologies								
	2.4 Interrupts and Memories								
	Chapter 3: Embedded System Programming	CLO3	8hr		5hr		6hr	6hr	25hr
	3.1 Program translation process								
	3.2 Representation of programs and their execution flow								
	3.3 Fundamentals of assembly language and linking								
	3.4 Mapping tasks in compilation								
	Chapter 4: Real-time Operating systems (RTOS)	CLO5	5hr		5 hr		5hr	5hr	20hr

	4.1 Introduction to RTOS								
	4.2 Switching mechanisms								
	4.3 Scheduling policies								
	4.4 message passing and shared memory communications								
	4.5 inter-process communication								
	Chapter 5: Low-power Computing	CLO4	3hr		3hr		3hr	6hr	15hr
	5.1 Introduction								
	5.2 Sources of energy consumption								
	5.3 instruction-level strategies for power management								
	5.4 memory system power consumption								
	5.5 system-level power management								
	Chapter 6: Networked Embedded Systems	CLO4	6hr		3hr		5hr	6hr	20hr
	6.1 Why networked embedded systems, examples of networked embedded systems								
	6.2 Interfacing and Mixed- signal systems								
	6.3 D/A and A/D conversions, how to partition A/D processing in interfaces								
								Total	**110hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1hr
2	Lab	15%	√		2hr
3	Mid exam	20 %	√		2hr
4	Project+Presentation	10%	√	√	2hr
				Total	7hrs
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Proteus Simulation Software
		2	Simulation Room
		3	Computer Lab

		4	Microcontroller Kit
13	Text book Reference:	1	Tammy Norgaard: Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers, Embedded Technology
		2	Wayne Wolf: Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman
		3	Frank Vahid / Tony Givargis: Embedded System Design: aunified hardware/software introduction, Wiley & Sons
		4	Qing Li, Caroline Yao: Real-Time Concepts for Embedded Systems
		5	Arnold S. Berger: Embedded Systems Design
		6	Stuart R. Ball: Embedded Microprocessor Systems: Real World design
		7	Michael Barr: Programming Embedded Systems in C and C ++

	Adama Science and Technology University				
1	College: **COEEC**		Department: **EPCE**		
2	Course Category	Major Elective			
	Course Name	**Programmable Logic Controllers and Robotics**			
	Course Code:	EPCE4302			
3	Synopsis:	This course provides an in-depth understanding of Programmable Logic Controllers (PLCs) and Robotics, focusing on their applications in industrial automation. It covers the fundamental principles, programming techniques, and integration of PLCs and robotics systems. Students will learn how to design, program, and troubleshoot PLC systems, as well as explore the kinematics and control of robotic systems. The course emphasizes hands-on experiences and project-based learning to reinforce theoretical concepts.			
4	Name(s) of Academic Staff:				
5	Semester/Year offered:	Semester:	II	Year	4
6	Credit Hour:	3(2hrs Lecture, 3hrs Laboratory)			
7	Prerequisite:	EPCE3204			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Apply knowledge of robotics to analyze and solve industrial automation problems.			
	CLO2	Motion Control for robotics manipulator			
	CLO3	Apply knowledge of PLCs and robotics to analyze and solve industrial automation problems.			
	CLO4	Design and program PLC systems using ladder logic programming language.			
	CLO5	Integrate PLCs and robotics systems for industrial automation applications.			
	CLO6	Demonstrate an understanding of safety considerations when working with PLCs and robotics.			
9	Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:				

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)								Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods	Test	Quiz	Assig nmen	Proje ct	Lab Exam	Mid exam	Final exam

									L	T	P	O							
	CLO1	√					√	√	√		√	√				√	√	√	√
	CLO2	√		√			√	√	√		√	√		√		√	√	√	√
	CLO3		√		√	√	√	√	√		√	√		√			√	√	
	CLO4	√	√		√	√	√	√	√		√	√		√			√	√	√
	CLO5	√	√				√	√	√		√	√		√			√	√	√
	CLO6	√					√	√	√		√	√				√	√	√	√
	Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box																		
10	Transferable Skills (Skills learned in the course of study which can be useful and utilized in other settings)																		
	1 ETAP, MATLAB, Usage and Other programming Skill																		

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						SLT
		Guided learning (F2F)				Guided learning (NF2F)	Independent learning (NF2F)	
		L	T	P	O			
Chapter One: **Introduction to Robotics**	CLO1	√		√		√		15hr
4.1. Introduction 1.1.1. Types of robots and their applications 1.1.2. Robot components and kinematics Robot programming languages								
Chapter Two: **Robot Motion Control**	CLO2	√		√		√		13hr
2.1. Joint and Cartesian coordinate systems 2.1.1. Trajectory planning and interpolation Path programming for robots								
Chapter Three: **Industrial automation and PLC**	CLO3	√		√		√		9hr
3.1. Overview of industrial automation Introduction to PLCs and their components								
Chapter Four **PLC Hardware and Wiring**	CLO4	√		√		√		9hr
3.2. Types of PLCs and their features 3.3. PLC wiring and input/output (I/O) modules Sensors and actuators for PLC systems								

14	**Chapter Five:** **PLC Programming**	CLO5							30hr
	4.1. PLC Programming Basics 4.1.1. Introduction to ladder logic programming 4.1.2. Creating simple ladder logic diagrams 4.1.3. Addressing and data types in PLC programming Advanced PLC Programming								
	4.1.4. Timer and counter instructions 4.1.5. Comparison and arithmetic instructions Data manipulation instructions								
	Chapter Six: **Integration and Industrial Applications of PLCs and Robotics**	CLO6	√		√		√		24hrs
	5.1. Integration of PLCs and Robotics 5.1.1. Communication protocols between PLCs and robots 5.1.2. Programming PLCs for robotic control 5.1.3. Case studies of PLC-robotics integration **5.2. Industrial Applications of PLCs and Robotics** 5.2.1. Automation in manufacturing processes 5.2.2. Robotic assembly and material handling PLC and robot safety considerations								
								Total	**95hr**

12	Assessment					
	Continuous Assessment		**Percentage Total-50(%)**	**F2F**	**NF2F**	**SLT**
	1	Project	20		√	12hr
	2	Lab report	10	√	√	8hr
	3	Mid exam	20	√		2hr
					Total	**Total**
	Final Exam	**Percentage 50(%)**	**F2F**	**NF2F**		**SLT**
	Final Exam	50%	√			**3hr**
					Total	**160hrs**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face.					

13	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	Workshop
14	Text book	1	Petruzella, F. D., "Programmable Logic Controllers," 5th ed., New York, NY, USA, McGraw-Hill, 2017.

		2	Siciliano, B., Sciavicco, L., Villani, L., and Oriolo, G., "Robotics: Modelling, Planning and Control," 2nd ed., London, UK, Springer, 2010.
	Reference: (note: ensure the latest edition /publication)	1	Groover, M. P., Weiss, M., and Nagel, R. N., "Industrial Robotics: Technology, Programming, and Applications," 2nd ed., Upper Saddle River, NJ, USA, Pearson Prentice Hall, 2008.
		2	Hugh Jack. Automating Manufacturing Systemswith PLCs(Version 5.0, May 4, 2007)
		3	Dunning, G., "PLC Programming using RSLogix 5000," New York, NY, USA, Wiley, 2016.
		4	C.T. Jones; STEP 7 in 7 Steps – A Practical Guide to Implementing S7-300/S7-400 ` Programmable Controllers; 5th edition
		5	Ned Mohan, MNPERE.Electric Drives---An Integrative Approach
		6	Herman Bruyninckx, Robot Kinematics and Dynamics, August 21, 2010
		7	B. Siciliano, L. Sciavicco, et al, Robotics modeling planning and control, Springer, 2009
		8	J. J. Craig, Introduction to robotics ,3rd edition, Pearson Education,2005
		9	W. Bolton; Programmable Logic Controllers; 5th edition
		10	S. K. Pillai, "A first course on electrical drives", New Age International
		11	Bimalk. Bose.Power Electronicsand Variable FrequencyDrives. IEEE Press

	Adama Science and Technology University					
1	College: **COEEC**			Department: **EPCE**		
2	Course Category	Major Elective				
	Course Name	**Introduction to Mechatronics**				
	Course Code:	EPCE4306				
3	Synopsis	This course Introduces technologies involved in mechatronics (Intelligent Electro-Mechanical Systems) and the techniques necessary to apply this technology to mechatronic system design. The topics includes but not limited to the following; electronics A/D, D/A converters, op-amps, filters, power devices; software program design, event-driven programming; hardware and DC Stepper Motors, solenoids, and robust sensing. Lab component of structural assignments and open-ended team project.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	4	
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)				
7	Prerequisite:	EPCE3204				
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:					

	CLO1	Discuss the basic concepts and architecture of mechatronic system.
	CLO2	Compute about control system modeling and representation of mechanical, hydraulic and other system
	CLO3	Analyze about different semiconductor device which are used in mechatronics system
	CLO4	Write and upload a program for different application
	CLO5	Integrate mechanical, control and computer engineering in the design of mechatronic system.
	CLO6	Design and development processes of mechatronics real application

10 Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√							√		√							√	√
CLO2	√	√			√	√	√	√		√				√		√	√	√
CLO3		√			√	√	√	√		√				√		√	√	√
CLO4	√		√	√	√	√	√	√		√		√		√		√		√
CLO5		√	√	√		√	√	√		√		√		√		√		√
CLO6	√	√		√	√	√	√	√		√		√		√		√		√

Indicate the relevancy between the CLO and SO by ticking “√” on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1 Setting up laboratory experiments of electrical machines and analysis of test results

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter One: Introduction to Mechatronics	CLO1	2		3		2	2	9hr
1.1. Introduction 1.2. Characteristics of Mechatronic Sy stem 1.3. Elements of Mechatronic System 1.63. Application of Mechatronics								
Chapter Two: 1.64. **Physical System Modelling**	CLO2	4		3		2	3	12hr
2.1 Mechanical system 2.2 Electrical system 2.3 Electromechanical system 2.4 Fluid system 1.65. 2.5 Thermal system								
Chapter Three: 1.66. **Electronics Converters.**	CLO3	4		6		3	2	15hr

3.1 Analog to Digital (ADC) 3.2 Digital to Analog (DAC) 3.3 OP-amp 1.67. Filter								
Chapter Four: Power Devices	CLO3	4		6		2	5	17hr
4.1 BJT Application Circuit 4.2 IGBT Application Circuit 4.3 MOSFET Application Circuit 4.4 TRIAC Application Circuit 4.5 SCR Application Circuit 2.21. Power Transistor Circuit								
Chapter Five: 2.22. **Mechatronic Sensors &Actuators**	CLO1	2		3		3	4	12hr
5.1 Introduction 5.2 Sensors 2.1.1. Light Sensor 2.1.2. Voltage Sensor 2.1.3. Current Sensor 2.1.4. Sound Sensor 5.3 Actuators 2.1.1.DC motor 2.1.2.Servo motor 2.1.3.Stepper motor 2.23. Solenoid								
Chapter Six: 2.24. **Event-driven programming.**	CLO4	4		6		1	4	15hr
6.1. Flow Charting **2.25.** 6.2 HMI								
Chapter Seven: Control system Vs Mechatronics system	CLO5 CLO6	4		6		3	4	17hr
7.1 PLC 7.2 PID controller Introduction 7.3 Microcontroller 3.10. Application of mechatronic system								
							Total	**97 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests	10	√		1hr
2	Assignments	10		√	7hr
3	Lab report	10	√	√	10hr
4	Mid exam	20	√		2hr
				Total	**20hr**
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT

	Final Exam	50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face				
12 6.	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab		
		2	MATLAB Software		
		3	Proteus professional software		
13	Text book/	1	Godfrey C. Onwubolu, Mechatronics principles and application.		
	Reference:	1	D. G. Alciatore and M. B. Histand , Introduction to Mechatronics.		
		2	R. Bishop, Mechatronic Systems, Sensors, and Actuators.		
		3	Arduino Community Websites		

	Adama Science and Technology University					
1	College: CoEEC		Department: ECE			
2	Course Category	Major Elective				
	Course Name	Biomedical instrumentation and analysis				
	Course Code:	ECEg5321				
3	Synopsis:	By giving general introduction to anatomy and Physiology of the human body, the key measurement principles of sensors found in healthcare technologies, medical devices used in hospitals, will be discussed. This course also shows how to build bio-potential amplifiers, record and interpret bioelectrical data (e.g. heart activity, muscle activity). It gives an insight into the working principles underlying the instrumentation for measuring respiratory and cardiovascular function such as blood pressure, blood flow as well as biochemical sensors. General discussions on medical imaging and prosthetics and therapeutic devices are covered.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	V	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	none				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Explain the structures and functions of the human organs.				
	CLO2	Analyze the fundamentals of electrical engineering as it relates to bioelectric phenomena and neural stimulation				
	CLO3	Interpret and apply the physical and chemical principles which govern the measurement of a biological variable or system by a transducer which converts the variable into an electrical signal				
	CLO4	Characterize various measurement devices and approaches including the underlying				

		biological process that generates the quantity to be measured or controlled
	CLO5	Acquire the role of the biomedical engineer in society. Including responsibility for protecting, specifically, patient safety, and, generally, the broader public interest.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Project	Mid Exam	Final Exam
CLO1		√					√	√	√	√			√	√	√	√
CLO2	√	√					√	√	√	√		√		√	√	√
CLO3	√	√			√	√	√	√	√	√			√	√	√	√
CLO4	√	√				√	√	√	√	√		√	√	√		√
CLO5		√		√			√	√	√			√		√		√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	LABVIEW software
2	
3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **Anatomy and physiology**	CLO1	2hr	1hr			1hr	1hr	5hr
Introduction								
.2 Cellular Organization								
1.3 Tissue								
1.4 Major organ Systems								
1.5 Homeostasis								
Chapter 2: **BASIC CONCEPTS OF Medical Instrumentation**	CLO2	5hr	3hr			3hr	7hr	18hr
2.1 Generalized Medical Instrumentation System								
2.2 Operational Modes								

	2.3 Medical Measurement Constraints								
	2.4 Classification Of Biomedical Instruments								
	2.5 Interfering And Modifying Input								
	2.6 Compensation Techniques								
	2.7 Design Criteria								
	2.8 Commercial Medical Instrumentation Process								
	2.9 Regulation Of Medical Devices								
	Chapter 3: **Bioelectric Signals**	CLO3	5hr		4hr		4hr	7hr	20hr
	3.1 Origin Of Biopotentials								
	3.2 Biopotential Electrode								
	3.3 Biopotential Amplifiers								
	3.4 Signal Characteristics: ECG, EEG								
	3.5 Lead System Artifact								
	Chapter 4: Biochemical Sensors	CLO4	4hr		3hr		3hr	7hr	17hr
	4.1 Blood-Gas And Acid-Base Physiology								
	4.2 Electrochemical Sensors								
	4.3 Blood Gas Monitoring								
	Chapter 5: **Applications**	CLO4	2hr		3hr		3hr	7hr	15hr
	5.1 Measurement of Blood Pressure, Flow And Volume								
	5.2 Measurements Of Respiratory System								
	5.3 Overview of Laboratory Instrumentation								
	Chapter 6: **Medical Imaging System**	CLO4	6hr		3hr		3hr	7hr	19hr
	6.1 Radiography								
	6.2 Computed Tomography								

	6.3 Magnetic Resonance Imaging								
	6.4 Ultrasonography								
	6.5 Contrast Agents								
	Chapter 7: **Therapeutic and Prosthetic Devices**	CLO5	2hr		1hr		2hr	3hr	8hr
	7.1 Implantable Devices								
	7.2 Ventilators								
	7.3 Hemodialysis								
	7.4 Laser								
	Total								102hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1hr
2	Test	10%	√		3hr
3	Project and Presentation	15%		√	7hr
4	Mid exam	20%	√		4hr
5					
Total					15hr

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		√		3hr
Grand Total SLT				120hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	LABVIEW Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Webster, Medical Instrumentation Application and Design, Wiley, 4th edition, 2009
		2	Schreiner, Bronzino, Peterson, Medical Instruments and Devices: Principles and Practices, CRC Press, 1st Edition, 2015
		3	John G. Webster (Editor), Bioinstrumentation, John Wiley & Sons, Inc, 2004

	Adama Science and Technology University					
1	College: **COEEC**		Department: **EPCE**			
2	Course Category	Major Elective				
	Course Name	**Power Electronics**				
	Course Code:	EPCE3202				
3	Synopsis	The course deals with the following major points: - Introduction to power electronics, an overview of different types of power semiconductor devices and their dynamic characteristics, operation and characteristics of controlled rectifiers, operation and switching techniques of DC-DC switching regulators, modulation techniques of PWM inverters, operation of AC voltage controller and Cycloconverters.				
4	Name(s) of Academic Staff:					
5	Semester/Year offered:	Semester:	II	Year	3	
6	Credit Hour:	3 (2hr Lecture, 3hr Tutorial)				
7	Prerequisite:	ECEg2202				
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Discuss concept, devices and types of power electronics				
	CLO2	Explain principle of operation of power semiconductor devices and switching characteristics				
	CLO3	Analyze various controlled rectifiers characteristics and evaluate their performance				
	CLO4	Evaluate operation of DC-DC switching converters				
	CLO5	Compute various PWM techniques and operation of voltage and current source inverters				
	CLO6	Evaluation and analysis of AC- AC convertor				
10	Mapping of the course learning outcomes to the Student Outcomes, Teaching Methods, and Assessment:					

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√		-	-	√	√		√	-	√	-	√	-	-	-		√	√
CLO2	√	√	-	-	√	√		√	-	√	-	√	-	√	-	√	√	√
CLO3	-	√	-	-	√	√	√	√	-	√	-	-	-	√	-	√	√	√
CLO4	-	√	-	-	√	√	√	√	-	√	-	√	-	√	-	√	-	√
CLO5	-	√	-	-	√	√	√	√	-	√	-	√	-	-	-	√	-	√
CLO6	-	√	√	√	√	√	√	√	-	√		-	-	√		√		√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10	Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB & Pspice programming Usage and Skill
	2	Design and experimentally verify the performance

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter One: Introduction to power electronics	CLO1	2				3	1	6hr
	1.68. Introduction								
	1.69. Types of power semiconductor devices								
	1.70. Types of power converters								
	1.71. Application of power electronics								
	Chapter Two: Power semiconductor devices.	CLO2	4		6		2	3	15hr
	2.1. Power semiconductor devices 2.1.1. Power Diodes 2.1.2. Thyristors: SCR, TRIAC, DIAC, GTO and MCT Power Transistors: BJT, MOSFET and IGBT								
	Chapter Three: Phase controlled Rectifiers.	CLO3	6		9		4	6	25hr
	3.8. Single and Three phase uncontrolled rectifiers								
	3.9. Single and Three phase semi-controlled rectifiers								
	3.10. Single and Three controlled rectifiers								
	Chapter Four: DC-DC converters.	CLO4	4		6		4	4	18hr
	4.1. Introduction								
	4.4. Control strategy								
	4.5. Switched mode converters 4.5.1. Buck converter 4.5.2. Boost converter 4.6. Buck-Boost converter								
	Chapter Five: Inverters.	CLO5	4		6		5	7	22hr
	5.4. PWM techniques								
	5.5. Single phase voltage source in verter								
	5.6. Three phase voltage source in verters (both 120° and 180° mode)								

	5.7. Single and three phase current source inverters								
	Chapter Six: AC-AC converters.	CLO6	4		3		2	3	12hr
	6.1. Single phase and three phase AC voltage regulators (both unidirectional and bidirectional)								
	6.2. Single phase and three phase cycloconverters (both step-up and step-down)								
								Total	**98 hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Test(s)	10	√		1hr
2	Assignments	5	√	√	6hr
3	Lab report	15	√	√	10hr
4	Mid exam	20	√		2hr
				Total	**19hr**
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50	√		**3 hrs.**
				Grand Total SLT	**120hrs.**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face

12 7.	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Computer Lab
		2	MATLAB Software
		3	OrCAD/ Pspice Software
13	Text book	1	Power Electronics by M.H.Rashid, 3rd edition, 2014.
	Reference:	1	Power Electronics by P.S.Bhimpra, 3rd edition, 2003.
		2	Power Electronics by Ned Mohan, 3rd edition, 2003.

Adama Science and Technology University		
1	**College: Humanities and Social Science**	**Department: Humanities Unit**
2	Course Category	Core Elective/focused Area Module
	Course Name	Project Management for Engineers
	Course Code:	SOSC5011
3	Synopsis:	This course is designed to equip students with fundamental concepts of project formulations, appraisal, planning and analysis of projects, the project cycle, market and demand analysis, raw material and supply study, location, site, and environmental assessment, production plan and plant capacity, technology and engineering study, financial & economic analysis , appraisal criteria, project financing, documentation, implementation monitoring and evaluation. This in turn helps to ensure that projects are successfully completed. As Engineers you are expected to take part in the initiation, planning, execution of projects related to your profession at years to come. Accordingly, the course intended to provide you basic knowledge of project management.

4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	3	
6	Credit Hour:	2				
7	Prerequisite/ Co-requisite: (if any)	None				

8 Course Learning Outcome (CLO): At the end of the course the student will be able to do:

CLO1	Define the core project management concepts and differentiate project from non-project activities.
CLO2	Understand the project life cycle and approaches of project cycle. Apply the knowledge of project life cycle to classify project activities in to different manageable phases.
CLO3	Locate the source of project ideas, identify and scrutinize worthy project ideas and develop a sound project proposal.
CLO4	Define and initiate a project and verify the project scope.
CLO5	Conduct feasibility studies, appraise and select the worthwhile project ideas. Estimate project and resource costs.
CLO6	Apply project management principles, concepts, tools and techniques to plan, execute the project plan and track project progress.
CLO7	Schedule project tasks and estimate resource requirements. Monitor and control project progress.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)								Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7		L	T	P	O	Test	Mid Exam	Assignment	Project	Lab-report
CLO1							√		√					√			
CLO2					√				√					√			
CLO3	√								√							√	
CLO4							√		√						√		
CLO5				√					√								
CLO6		√							√				√				
CLO7			√						√						√		

Indicate the relevancy between the CLO and PO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Feasibility studies

	2	sk scheduling and resource estimation
	3	PERT/CPM application for project planning and scheduling

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Overview of project management	**1**	**4h**					**4h**	**8h**
	1.1. Meaning and definition of project								
	1.2. Features of a project								
	1.3. Project Parameters								
	1.4. Classification of projects								
	1.5. Project Management- Meaning, Roles and Skills								
	1.6. Project environment and stakeholders								
	Chapter 2: Project Cycle	**2**	**4h**					**6h**	**10h**
	2.1. Meaning and definition of Project Cycle								
	2.2. World Bank Project Cycle								
	2.3. UNIDO Project Cycle								
	Chapter 3: Project Identification	**3 & 4**	**4h**					**4h**	**8h**
	3.1. Project Idea – Meaning								
	3.2. Sources of Project Ideas 3.2.1. Macro sources 3.2.2. Micro sources								
	Chapter 4: Project Evaluation and Analysis	**5**	**9h**					**14h**	**23h**
	4.1. Market Analysis								
	4.2. Engineering and Technological analysis								
	4.3. Economic Analysis								
	4.4. Environmental Analysis								
	4.5. Financial Analysis								
	Chapter 5: Project Management	**6 &7**	**5h**					**6h**	**11h**
	5.1. Introduction								
	5.2. Project planning and scheduling (CPM and PERT)								

	5.3. Project implementation and control								
	Total		**26h**					**34h**	**60h**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Test(1)	10%	√		2h
2	Mid Exam	20%	√		2h
3	Assignments	10%		√	2h
4	Project proposal	20%		√	10h
Total		**60%**	**4h**	**12 h**	**16h**
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		40%	√		**4h**
				Grand Total SLT	**80h**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Choose an item.
		2	Choose an item.
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Albert Lester (2014), Project Management, Planning and Control 6th Elsevier Ltd.
		2	James P. Lewis. (2007), Fundamentals of project management, 3rd ed. Printed in the United States of America
		3	Prasanna Chandra, Projects – Planning Analysis, Financing, Implementation, and Review.
		4	Singh, Narendra, (2003), Project management and control, 3rd edition, New Delhi, Himalaya Publishing house
		5	Lewis, James P, (2001) Project planning, scheduling and control, 3rd edition, New Delhi: Tata MCGraw-hill companies, Inc., India.
		6	UNIDO, A Manual for the Preparations of Industrial Feasibility Studies.

Adama Science and Technology University		
1	College: CoEEC	Department: ECE
2	Course Category	Major Elective
	Course Name	**Optics and Optical Communication**
	Course Code:	ECE 5302

3	Synopsis:	Introduction of optical communication: propagation of light, ray theory and model. Different types of fibers: Single and multimode fibers, step index fibers. Signal degradation due to scattering, attenuation and dispersion and its losses. Optical Sources; Light emitting diode, Laser diode, rate equation, Modulators: electro optic, electro-absorption. Optical receivers: Photodiodes: p-i-n, avalanche, responsively, capacitance, transit time. Optical receiver performance: Q factor, bit error ratio, sensitivity degradation. Non-Linear effects: solition based communication. Optical communication system architecture: optical amplifier, Fiber optic link design, and amplified WDM systems. Free Space Optics (FSO) in optical communication applications..					
4	Name(s) of Academic Staff:						
5	Semester and Year offered:	Semester:	II	Year:	V		
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	ECEg4203 Digital Communication					

8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO 1	To understand the background of optical fiber communication and the generation of optical structure and propagation technique of optical fibers
	CLO 2	Analyze the principle of various light propagation and how the optical signal is transmit in optical fibers for communication
	CLO 3	To classify the types of attenuation and propagation mechanism in various fibers and how the optical signal dispersed
	CLO 4	To understand the various light sources used in optical fibers for communication To acquire knowledge in industrial and medical applications of fibers
	CLO 5	To understand and design the various optical detector materials for device applications
	CLO 6	To acquire knowledge in industrial and medical applications of fibers
	CLO 7	Design and analyzing different modulation techniques in optical fiber communication

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning	Student Outcomes (SO)												
									Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods	Lab	Project	Quiz	Mid	Final Exam

									L	T	P	O					
	CLO 1	√							√	√	√			√		√	√
	CLO 2		√						√	√	√		√	√		√	√
	CLO 3			√					√	√	√		√	√	√	√	√
	CLO 4				√				√	√	√		√	√	√		√
	CLO 5					√			√	√	√		√	√			√
	CLO 6						√		√					√			√
	CLO 7							√	√					√			√
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	
	2	
	3	

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Optical Communications- Brief Review and Evolution	CLO 1	2hr	-	-	-	1hr	3hr	6hr
	1.1 Historical Development Optical Fiber Communication								
	1.2 General Optical Fiber Communication System								
	1.3 Advantages of Optical								

	Fiber Communications								
	1.4 Disadvantages of Optical Fiber Communications								
	Chapter 2: The Principles of Fiber Optics Communications and Characteristics	CLO 2	4hr	-	2hr	-	1hr	5hr	12hr
	2.1 Ray Transmission Theory								
	2.1.1. Reflection.								
	2.1.2. Refraction								
	2.2. Light Propagation								
	2.2.1. Total Internal Reflection								
	2.2.2. Mode Propagation								
	2.2.3. Acceptance Angle								
	2.2.4. Numerical Aperture								
	2.3. Types of Optical Fibers								
	2.3.1 Multimode Fibers								
	2.3.2 Single Mode Fibers								
	Chapter 3: Signal Degradation in Optical Fibers	CLO 3	4hr		4hr		2hr	7hr	17hr
	3.1 Splices and Connectors.								
	3.2 Dispersion								
	3.2.1 Intermodal dispersion								
	3.2.2 Material dispersion								
	3.2.3 Waveguide dispersion								
	3.3 Losses.								
	3.3.1 Scattering losses								
	3.3.2 Absorption losses								
	3.3.3 Bending losses								
	3.4 Fiber Optic Couplers								
	Chapter 4: Optical Sources	CLO	4hr	-	4h	-	2hr	7hr	17hr

		4			r				
	4.1 Introduction to Optical Sources								
	4.2 Diode and Light-Emitting Diode (LED)								
	4.2.1 Working Principle of LEDs								
	4.2.2 Advantages and Disadvantages of LEDs								
	4.2.3 Applications of LEDs								
	4.3 Diode Laser (DL).								
	4.3.1 Structure of Diode Laser								
	4.3.2 Homo- and Hetero-structure diode lasers								
	4.3.3 Operating Wavelengths								
	4.4 Fiber Laser (FL)								
	Chapter 5: Optical Detectors in Fiber Optic Communications	CLO 5	2hr	-	4h r	-	2hr	6hr	14hr
	5.1 Introduction to Photo-detectors								
	5.2 Basic Requirements for detectors in Fiber optics								
	5.3 Types of Photo-detectors								
	5.3.1 Positive-Intrinsic-Negative (PIN)								
	5.3.2 Avalanche Photo-Detector (APD) diodes								
	5.3.3 APD Verses PIN								
	5.4 Optical Detection Principle								
	5.4.1 Photo-detectors								
	5.4.2 Photodiodes								
	5.4.3 Materials for Photo-detectors								
	5.5 Applications of Photo-detectors								
	Chapter 6: Applications and communication system	CLO 6	4hr	-	4h r	-	2hr	6hr	16hr

6.2 Active and Passive								
6.3 Medical Applications								
6.4 Endoscope								
6.5 Soliton Pulses								
6.6 General Applications of optical fiber communication based on the characteristics								
Chapter 7: Modulation and Multiplexing	CLO 7	4hr		7hr		3hr	7hr	21hr
7.1 Modulation								
7.1.1 Amplitude Modulation (AM)								
7.1.2 Frequency Modulation (FM)								
7.1.3 Phase Modulation (PM)								
7.2 Multiplexing								
7.2.1 Time Division Multiplexing								
7.2.2 Frequency Division Multiplexing								
7.2.3 Wavelength Division Multiplexing								
Total								103hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5	1hr		1hr
2	Lab	10	3hr	3hr	6hr
3	Project + presentation	15	1hr	6hr	7hr
4	Mid Exam	20	2hr		2hr
				Total	16hr

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		3hr		3hr
			Grand Total SLT	122hr

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room ...etc.)	1	optisystem Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Fiber-Optic Communications Technology, Djafar K. Mynbaev and Lowell L. Scheiner Prentice Hall, 2001
		2	Light wave Technology: Telecommunication Systems, Govind P. Agrawal John Wiley and Son, Inc., 2005
		3	Light wave Technology : Components and Devices by Govind P. Agrawal John Wiley and Son, Inc., 2004
		4	AGRAWAL, G. P. (2001). Nonlinear Fiber Optics (3rd ed.)
		5	. Palanisamy P.K., Materials Science, Scitech Publications Pvt ltd., (2002)
		6	Optical Electronics; by A. Yariv, 3rd Edition. Holt, Rinehart & Winston, 1991.
		7	Optical Communication by John M Senior

	Adama Science and Technology University	
1	College: CoEEC	Department: ECE
2	Course Category	**Major Elective**
	Course Name	Satellite Communication
	Course Code:	ECEg-5310
3	Synopsis	This course aims at providing thorough information of the conventional and upcoming satellite communication technology. The course covers the History of Satellite communication, Basic concepts of Satellite Communications, Communication Networks and Services, Comparison of Network Transmission technologies, Orbital and Spacecraft problems, Growth of Satellite communications, Orbital mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and launch vehicles, Orbital effects in communication system performance, Satellite Subsystems, Attitude and Control Systems (AOCS), Telemetry, Tracking, Command and monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment reliability and space qualification, Basic transmission theory, System noise temperature and G/T Ratio, Design of downlinks, SatelHrsite systems using small earth stations, Uplink design, Design of specified C/N: Combining C/N and C/I values in satellite links system design examples.
4	Name(s) of Academic	

	Staff:				
5	Semester/Year offered:	Semester:	II	Year	5
6	Credit Hour:	3			
7	Prerequisite:	ECEg-4204- Antenna and Radio Wave Propagation			
9	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Understand the orbital and functional principles of satellite communication systems			
	CLO2	Architect, interpret, and select appropriate technologies for implementation of specified satellite communication systems			
	CLO3	Analyze the various losses during the propagation and their impact on satellite link.			
	CLO4	Design Satellite Link for Up Link and Down Link and Calculate complete link budgets			
	CLO5	Apply advanced techniques and practical aspects of satellite communication in research			

10 Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)							Teaching Methods				Assessment						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Test	Quiz	Assignment	Project	Lab report	Mid exam	Final exam
CLO1	√							√									√	√
CLO2	√							√		√		√			√	√	√	√
CLO3	√							√		√		√			√	√		√
CLO4						√		√		√		√			√	√		√
CLO5							√	√			√				√	√		√

Indicate the relevancy between the CLO and PO by ticking “√” on the appropriate relevant box

10 Transferable Skills; (Skills learned in the course of study which can be useful and utilized in other settings)

1 MATLAB software

11 **Distribution of Student Learning Time (SLT)**

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **INTRODUCTION**	CLO1	√				√	√	10hr
History of Satellite communication								
Basic concepts of Satellite Communications								
Communication Networks and Services								
Comparison of Network Transmission technologies								
Orbital and Spacecraft problems,								
Growth of Satellite communications								

	Chapter 2: **ORBITS AND LAUNCHING METHODS**	CLO2	√		√		√	√	20hr
	2.1 Introduction, Kepler's First Law,Kepler's Second Law, Kepler's Third Law								
	2.2 Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights								
	2.3 Orbital mechanics, Look angle determination								
	2.4 Orbital perturbations, Orbital determination,								
	2.5 Orbital effects in communication system performance								
	2.6 Orbit Per turbations, Effects of a non spherical earth, Atmospheric drag								
	2.7 Geostationary Orbit, The Polar Mount Antenna, Limits of Visibility								
	2.8 Near Geostationary Orbits, Earth Eclipse of Satellite								
	2.9 Sun Transit Outage, Launching Orbits.								
	Chapter 3: **SATELLITE SUB SYSTEMS**	CLO2	√		√		√	√	20hr
	3.1 Satellite Subsystems								
	3.2 Attitude and Control Systems (AOCS),								
	3.3 Telemetry, Tracking, Command and monitoring, Power systems								
	3.4 Communication subsystems,								
	3.5 Satellite antennas, Equipment reliability space qualification								
	3.6 Spinning satellite stabilization, Momentum wheel stabilization								
	3.7 Station Keeping, Thermal Control, TT&C Subsystem, Transponders								
	3.8 The wideband receiver, The input demultiplexer								
	Chapter 4: **RADIO WAVE PROPAGATION AND POLARIZATION**	CLO3	√		√	√	√		13hr
	4.1 Introduction								
	4.2 Atmospheric Losses, Ionos pheric Effects								
	4.3 Rain Attenuation, Other Propagat ion Impairments								

	4.4 Antenna Polarization								
	4.5 Polarization of Satellite Signals								
	4.6 Cross Polarization, Discrimination,								
	4.7 Ionospheric Depolarizaon								
	4.8 Rain Depolarization, Ice Depolarization								
	Chapter 5: **SATELLITE COMMUNICATION LINK DESIGN**	CLO4	√		√		√	√	22hr
	5.1 Introduction, Basic transmission theory								
	5.2 Equivalent Isotropic Radiated Power, Transmission Losses								
	5.3 Free-space transmission								
	5.4 Feeder losses, Antenna misalignment losses, Fixed atmospheric and ionospheric losses								
	5.5 The Link-Power Budget Equation								
	5.6 System noise temperature and G/T Ratio								
	5.7 Design of downlinks, SatelHrsite systems using small earth stations								
	5.8 Uplink design, Design of specified C/N: Combining C/N and C/I values in satellite links system design examples.								
	Chapter 6: **SATELLITE ACCESS AND SPECIALIZED SERVICES**	CLO4 & CLO5	√			√	√	√	10hr
	6.1 Introduction, Single Access								
	6.2 Preassigned FDMA, Demand-Assigned FDMA								
	6.3 Spade System, TDMA, Preassigned TDMA								
	6.4 Demand-assigned TDMA, Satellite-Switched TDMA								
	6.5 Code-Division Multiple Access								
	6.6 Satellite Mobile Services, VSATs								
	6.7 Radarsat, Global Positioning Satellite System (GPS),								
	6.8 Orbcomm, Iridium.								
								Total	**95hrs.**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		1.5hr
2	Lab	15%	√		6hr
3	Project and Presentation	10%		√	9hr

	4	Mid exam	20%	√		5.5hr
					Total	22hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√		**3 hrs.**
					Grand Total SLT	**120hrs.**
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non-Face to Face					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	Computer lab
		3	
		4	

13	Text book Reference:	1	Timothy Pratt, Charles Bostian, Jeremy Allnutt, ―Satellite Communications, John Wiley & Sons.
		2	Dennis Roody, ―Satellite Communications‖, McGraw Hill
		3	Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson Satellite - Communication Systems Engineering, Pearson. (Second Edition),
		4	Anil K. Maini, Varsha Agarwal- Satellite Technology, Principles and Applications, Wiley. (Second Edition)
		5	G. Maral, M. Bousquet, Z. Sun -Satellite Communications Systems: systems, techniques and technology, John Willy and sons.(5th edition)

Adama Science and Technology University					
1	College: CoEEC		Department: ECE		
2	Course Category	Major Elective			
	Course Name	Analysis & design of Digital integrated circuit			
	Course Code:	ECEg-5304			
3	Synopsis :	This course explores on the latest CMOS and related recent technologies. The emphasis of the course will be on designing and analysis of CMOS circuits. This course will provide an excellent introduction to digital circuit design for students			
4	Name(s) of Academic Staff:				
5	Semester and Year offered:	Semester:	Year:	II	
6	Credit Hour:	3			
7	Prerequisite	Microelectronics Devices & Circuits (ECEg-3206)			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:				
	CLO1	Define the basic knowledge about the understand of MOS transistor			
	CLO2	Elaborate basic IC fabrication process steps, also fabrication methods of MOS, PMOS, NMOS and CMOS.			

	CLO3	Discuss about Static and Dynamic behaviours of MOS device.
	CLO4	Elaborate the structure and operation of CMOS inverter, Energy, Power dissipation and various delays related to CMOS inverter
	CLO5	Design and analysis of sequential circuit using CMOS
	CLO6	Compare the Impact of Interconnect Parasitic like Capacitive, Resistive and Inductive
	CLO7	Design an arithmetic building block using MOS transistors

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)															
	SO1	SO2	SO3	SO4		SO6	SO7	Teaching Methods		Assessment		Test	Quiz	Project	Mid Exam	Final Exam
								L	T	P	O					
CLO1	√							√	√						√	√
CLO2	√							√	√				√	√	√	√
CLO3		√	√					√	√			√		√	√	√
CLO4			√	√				√	√			√		√		√
CLO5		√				√	√	√	√			√		√		√
CLO6					√			√	√					√		√
CLO7					√	√		√	√					√		√

The relevancy between the CLO and SO is indicated by "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Fabrication of MOS devices
2	Designing and analysis of low power VLSI circuits

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						
		Guided Learning (F2F)				Guide Learning (NF2F)	Independent Learning (NF2F)	Total SLT
		L	T	P	O			

	<u>Chapter 1:</u> Review of MOS device and its scaling	CLO 1	2hr				1 hr	3 hr	6 hr
	1.1 A Historical Perspective of IC Technology								
	1.2 MOS & CMOS device operation & Characteristics								
	1.3 Scaling down of MOS								
	1.4 Secondary effects of Scaling MOS device								
	<u>Chapter2:</u> IC Fabrication	CLO 2	2 hr	3 hr			2 hr	3 hrs	12hr
	2.1 Steps of IC fabrication								
	2.2 Patterning, layering and Etching								
	2.3Fabrication of NMOS & PMOS								
	2.4 Fabrications of CMOS								
	2.5 Latch-up in CMOS and its remedy								
	<u>Chapter 3:</u> CMOS Inverter	CLO 3	2 hrs	2hr			1 hr	3 hrs	8hr
	3.1 CMOS Inverter								
	3.2 CMOS inverter working and region of operations								
	3.3 The Static CMOS inverter behavior								
	3.4 The Dynamic CMOS inverter Behavior								
	3.5 CMOS inverter Power, Energy,								

	and Energy-Delay								
	Chapter4: Designing Combinational Logic Gates in CMOS	CLO 4	2 hr	2hrs			4	4	12 hr
	4.1 Introduction to designing of combinational circuits in CMOS								
	4.2Gate designing using CMOS								
	4.3 Static CMOS Design								
	4.4 Static CMOS Design								
	4.5 Rationed Logic, PassTransistor Logic								
	Chapter5: Designing Sequential Logic Circuits	CLO 5	2 hrs	2hrs			2 hrs	3 hrs	9 hr
	5.1 Introduction								
	5.2 Static Latches and Registers								
	5.3 Dynamic Latches and Registers								
	5.4 Designing of SRAM								
	5.5 Designing of DRAM								
	Chapter 6 Interconnect Parasitic	CLO 6	2 hrs	2 hrs			3 hrs	4 hrs	10hr
	6.1 Introduction Interconnects Parasitic								
	6.2 Resistance Parasitic								
	6.3 Capacitance Parasitic								
	6.4 Inductance Parasitic								
	Chapter:7 Designing	CLO	2 hrs	2 hrs			4 nhrs	4 hrs	12hr

	Arithmetic Building Blocks	7							
	7.1Introduction to arithmetic designing in CMOS		√				√		
	7.2 The Adder								
	7.3 The Multiplier								
	7.3 The Shifter								
	Total								80hr

Assessments					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	**Test**	**10%**	√		2 hr
2	**Quiz**	**5%**	√		2 hr
3	Project and Presentation	**15%**		√	15 hr
4	**Mid exam**	**20%**	√		3 hr
Total					22 hr
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		**50%**	√		3hr
Grand Total SLT		130 hr			

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to FaceNote: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver course (e.g., software, computer lab, simulation room ...etc.)	1	VHDL
		2	VLSI LAB

13	Text book and referen ce: (Note: ensure the latest edition /publication)	1	Jan M Rabaey- Digital integrated circuits _ a design perspective-Pearson Education (2003)
		2	Douglas A. Pucknell, Basic VLSI Design, PHI 2015
		3	S. M. Sze and K. K. Ng, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2007.
		4	A. S. Sedra and K. C. Smith, "Microelectronic Circuits: Theory and Applications", 6th edition, Oxford Press, 2013.
		5	CMOS: Circuit Design, Layout, and Simulation, 4th Edition by R. Jacob Baker

<table>
<tr><td colspan="7">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="3">College: CoEEC</td><td colspan="3">Department: ECE</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="5">Major Elective</td></tr>
<tr><td>Course Name</td><td colspan="5">Telecommunication Networks and Switching</td></tr>
<tr><td>Course Code:</td><td colspan="5">ECEg-5306</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">Students will be able to acquire knowledge on systems view of communications, integrating perspectives from computer science, electrical engineering, electronic engineering and communication engineering. Students will learn to consider tele-traffic demands, quality of service, scalability, performance and cost into consideration to develop requirements and architectures. They will be able to understand recent topics like switching systems, time divisions witching systems, data communication Networks. ISDN, voice data integration and importance of telephone traffic analysis and telephone networks. The Course also provides a good understanding of the fundamentals and application of telecommunication networks i.e. PSTN, PDN and ISDN.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5"></td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>V</td><td>Year:</td><td>II</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">3</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">ECEg-4203 - Digital Communication</td></tr>
<tr><td rowspan="6">8</td><td colspan="6">Course Learning Outcome (CLO): At the end of the course the student will be able to do:</td></tr>
<tr><td>CLO1</td><td colspan="5">Recall and discuss the basic knowledge about the telecommunication systems and describe the need for switching systems and their evolution from analogue to digital.</td></tr>
<tr><td>CLO2</td><td colspan="5">Discuss various Switching techniques, types and roles in the context of Telecommunication Network</td></tr>
<tr><td>CLO3</td><td colspan="5">Understand clear knowledge regarding telecommunication signaling system and their types</td></tr>
<tr><td>CLO4</td><td colspan="5">Create the knowledge about telecommunication traffic and analyze how a telecommunication network handles traffic</td></tr>
<tr><td>CLO5</td><td colspan="5">To expose through the evolution of telephone network, data network and integrated service digital network</td></tr>
</table>

9	Mapping of the course Learning Outcomes to the Student Learning Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Learning Outcomes (SO)															
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Test	Lab	Project	Mid Exam	Final Exam
CLO1	√							√	√				√	√	√	√
CLO2	√							√	√			√	√	√	√	√
CLO3	√							√	√	√		√	√	√	√	√
CLO4	√	√	√					√	√	√		√	√	√		√
CLO5	√	√				√	√	√	√	√			√	√		√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Telecommunication Network Analysis and Design Skills
	2	Telecommunication Network Operations Skills
	3	Telecommunication Network Standard Selection Skills

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter-1:Introduction	CLO1	6hr				4hr	5hr	**15 hr**
1.1 Evolution of Telecommunication								
1.2 Introduction and significance of Telecommunication Networks.								
1.3 Network load parameters and Traffic Measurement								
1.4 Timing diagrams for land line to mobile communication and vice versa								

	1.5 Telecommunication Standards								
	Chapter 2: Digital Telecom Transmission and Applications	CLO2	6hr				8hr	6hr	**20 hr**
	2.1 Long-Haul Network & Exchange Area Network								
	2.2 Plesiochronous Transmission Hierarchy								
	2.3 Synchronous optical network & ATM								
	Chapter 3: Public Switched Telephone Network& Introduction To Switching	CLO3	6hr		8hr		6hr		**20 hr**
	3.1 PSTN structure , Components and Signalling								
	3.2 Customer Premises Equipment								
	3.3 Local Area Radio Networks								
	3.4 Local Access networks								
	3.5 Circuit Switching & Packet Switching								
	Chapter 4: Switching Techniques	CLO4	6hr		8hr		6hr		**20 hr**
	4.1 Evolution of Switching Techniques								
	4.2 Time division switching.								
	4.3 Space Division switching								
	4.4 Two dimensional switching								
	4.5 Modeling Switching Systems								
	4.6 STS switching								

	4.7 Blocking Models and Loss Estimates								
	4.8 TST switching								
	Chapter 5: Digital Subscriber Line Technology	CLO5	6hr		8hr		6hr		**20 hr**
	5.1 Introduction to Digital subscriber line Technology & Applications								
	5.2 Advanced Digital Subscriber line Technology								
	5.3 High-bit rate DSL ,very-High-Bit-Rate DSL								
	Total								**95 hr**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Lab	10%	√		10 hr
2	Quiz	5%		√	1 hr
3	Mid exam	20%	√		2 hr
4	Project and Presentation	15%		√	9 hr
				Total	**22 hr**

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50	√		**3 hr**
			Grand Total SLT	**120 hr**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face

Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	CCNA SWITCHING VIRTUAL LAB
		2	Computer lab
		3	WireShark, Packet Tracer
		4	
		5	
13	Text book and	1	Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications

	reference: (note: ensure the latest edition /publication)	2	J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education.
		3	John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications.
		4	Behrouz A. Forouzan, “Data Communications and Networking,” TMH, 2nd Edition, 2002.
		5	Tomasi,” Introduction to Data Communication and Networking,” Pearson Education, 1 st Edition, 2007.

Adama Science and Technology University							
1	College: CoEEC			Department: ECE			
2	Course Category	Major Elective					
	Course Name	Introduction to Computer Vision					
	Course Code:	ECEg5308					
3	Synopsis:	Introducing theory and application of computer vision. Topics includes digital image fundamentals, binary vision, gray-level vision, Imaging optics, sensors and sampling patterns, image pre-processing, Frequency domain image processing, Color image processing, linear and nonlinear operations on 2D and 3D images images, enhancement, fundamentals of semantic image processing, practical applications of imaging system.					
4	Name(s) of Academic Staff:						
5	Semester and Year offered:	Semester:	II	Year:	V		
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	Math2201: Linear Mathematics ,ECEg3205: Digital Signal Processing					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Understand fundamental technologies for digital image, compression, analysis, and processing.					
	CLO2	Select and Solve algorithms, analytical tools, and practical implementations of various digital 2D and 3D image applications.					
	CLO3	Explain how digital images are represented and manipulated in a computer, including reading and writing from storage, and displaying					
	CLO4	Develop and Write programs which implements fundamentals of Computer Vision algorithms					
	CLO5	Describe the mathematical description of computer vision techniques and know how to go from the equations to code					
9	Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:						

	Course Learning Outcomes (CLO)	Student Outcomes (PO)															
									Teaching Methods				Assessment				
		SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Lab	Quiz	Project	Mid Exam	Final Exam
	CLO1		√						√	√	√				√	√	√
	CLO2		√						√	√	√		√		√	√	√
	CLO3			√					√	√	√		√	√	√		√
	CLO4						√	√	√	√	√		√		√		√
	CLO5				√				√	√	√		√		√		√
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	MATLAB programming
	2	
	3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Computer Vision Fundamentals	CLO1	2hr	2hr			2hr	4hr	10hr
1.1 Goal of computer vision, Vision as a source of semantic information, Challenges in computer vision, Connections to other disciplines								
1.2 Cameras, Pinhole camera, Discrete and Continuous Sample, Projection properties, Vanishing points, Perspective distortion, Modeling projection								

	1.3 Homogeneous coordinates, Perspective Projection Matrix, Building a real camera, Lens Flaws-Chromatic Aberration, Capturing light								
	1.4 Image formation, Radiometry-Measuring light, Solid Angle, Radiance, Irradiance, Radiometry of thin lenses,								
	1.5 Bidirectional reflectance distribution function (BRDF), Diffuse reflection- Lambert's law, Photometric stereo,								
	1.6 Image model, Least squares problem, Finding the direction of the light source								
	Chapter 2: Image Details in 2D	CLO 2	3hr	4hr			3hr	5hr	15hr
	2.1 Digital image and pixel, Digital image representation, Key stages of digital image processing								
	2.2 Elements of Visual Perception. - Light and the Electromagnetic Spectrum								
	2.3 Image Sensing and Acquisition. - Image Sampling and Quantization								
	2.4 Some Basic Relationships between Pixels, Linear and Nonlinear Operations								
	2.5 Basic Gray Level Transformations								

	Chapter 3: Color Image	CLO3	3hr	2hr			2hr	3hr	10hr	
	3.1 Color Fundamentals, Color Models, Electromagnetic spectrum, The Physics of Light, The Eye details									
	3.2 Standardizing color experience									
	3.3 Linear color spaces, Linear color spaces: CIE XYZ									
	3.4 Chromatic adaptation, White balance									
	3.5 Uses of color in computer vision									
	Chapter 4: Spatial Filtering	CLO3	4hr	3hr			3hr	5hr	15hr	
	4.1 Spatial Filtering, Linear Spatial Filtering,									
	4.2 Spatial Filters – convolution, Correlation									
	4.3 Nonlinear Spatial Filtering, Smoothing Spatial Filters, Order-statistics filtering									
	4.4 Spatial filtering for image sharpening, Laplacian for image sharpening									
	4.5 Smoothing Filters (low-pass), Sharpening Filters (high-pass)									
	Chapter 5: Image edge detection in the Spatial Domain and fitting	CLO4	4hr	4hr			4hr	6hr	18hr	
	5.1 Edge detection, Derivatives with convolution, Finite difference filters,Image gradient,									

	5.2 The Canny edge detector,Feature extraction, Characteristics of good features,									
	5.3 Corner Detection: Mathematics, Corner response function, Invariance and covariance,									
	5.4 Blob detection, Scale selection, Scale normalization, Blob detection in 2D, Scale-space blob detector									
	5.5 Affine normalization, Fitting, Least squares line fitting, Least squares as likelihood maximization, Random sample consensus (RANSAC)									
	5.6 The Hough transform, Parameter space representation, Effect of noise, Generalized Hough transform									
	Chapter 6: Image alignment	CLO4 and CLO5	4hr	3hr			3hr	5hr	15hr	
	6.1 Image alignment, 2D transformation models, Homography, Direct linear transform									
	6.2 Robust and large-scale alignment, Robust feature-based alignment, Feature descriptors									
	6.3 Scalability: Alignment to large databases									
	6.4 Voting for geometric transformations									
	Total								83hr	
	Assessment									

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Programming Lab	15%	√		16hr
	2	Assignment 1	5%		√	8hr
	3	Project	10%		√	8hr
	4	Mid exam	20%	√		2hr
	Total					34hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			√		3hr
	Grand Total SLT					120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	Computer lab
13	Text book and reference: (note: ensure the latest edition /publication)	1	Forsyth & Ponce, Computer Vision: A Modern Approach
		2	Richard Szeliski, Computer Vision: Algorithms and Applications (available online)
		3	Digital Image Processing Third Edition, by Rafael C. Gonzalez and Richard E. Woods
		4	Image processing Programming material prepared by Dr. Satyasis Mishra

Adama Science and Technology University			
1	College: CoEEC		Department: ECE
2	Course Category	Major Elective	
	Course Name	**Digital Image Processing**	
	Course Code:	ECEg-5314	
3	Synopsis:	The course basically designed in the areas of Imaging optics, sensors and sampling patterns, image pre-processing, Frequency domain image processing, Color image processing, linear and nonlinear operations on images, enhancement fundamentals of semantic image processing, practical applications of imaging system, image segmentation and its application to biomedical imaging, satellite imaging etc. This	

		course focuses the students ability in analyzing technologies for digital image, compression, writing and developing of algorithms, implementations of various digital image applications, Image representation and conversant with the image processing techniques.
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: II Year: V
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	Math2201: Linear Mathematics ,ECEg3205: Digital Signal Processing
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	

CLO1	Analyze image acquisition technique, reading and writing of new images, analysis of different image processing techniques.
CLO2	Select and Solve image processing algorithms, analytical tools, and practical implementations of various digital image applications.
CLO3	Develop and write programming code which simplifies the complex image processing algorithms.
CLO4	Describe the mathematical analysis of image processing techniques and know how to develop code for application purpose
CLO5	Develop and Analyze algorithms applications to different complex medical imaging problems manipulated in a higher version computer system

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)															
								Teaching Methods				Assessment				
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O	Lab	Project	Quiz	Mid Exam	Final Exam
CLO1		√						√	√	√			√		√	√
CLO2		√						√	√	√		√	√		√	√
CLO3					√			√	√	√		√	√	√		√
CLO4				√				√	√	√		√	√	√		√
CLO5						√	√	√	√	√		√	√			√

Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB software/PYTHON software

	2	
	3	

11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Digital Image Fundamentals	CLO1	2hr	-	-	-	1hr	3hr	6hr
	1.5 Digital image and pixel								
	1.6 Digital image representation								
	1.7 Key stages of digital image processing								
	1.8 Elements of Visual Perception. - Light and the Electromagnetic Spectrum.								
	1.5 Image Sensing and Acquisition. - Image Sampling and Quantization								
	Chapter 2: Image Enhancement in the Spatial Domain	CLO2	4hr	-	5hr	-	2hr	5hr	16hr
	2.1 Some Basic Relationships between Pixels.								
	2.2 Linear and Nonlinear Operations.								
	2.3 Basic Gray Level Transformations								
	2.4 Histogram Processing.								
	2.5 Basics of Spatial Filtering								
	2.6 Smoothing Spatial Filters								
	2.7 Sharpening Spatial Filters.								
	Chapter 3: Image Enhancement in Frequency	CLO3	4hr	-	5hr	-	2hr	5hr	16hr

	domain								
	3.1 Frequency Domain Methods								
	3.2 Two Dimensional Fourier Transform and its Inverse, Discrete Cosine Transform, Complex wavelet Transform, Discrete Orthonormal S-Transform								
	3.3 Frequency Domain Filtering								
	3.4 Image Smoothing Using Frequency Domain Filters								
	3.5 Image Sharpening Using Frequency Domain Filters								
	Chapter 4: Color Image Processing	CLO3	6hr	-	4hr	-	3	7	20hr
	4.1 Color Fundamentals, Color Models.								
	4.2 Pseudocolor Image Processing.								
	4.3 Basics of Full-Color Image Processing. Color Transformations								
	4.4 Smoothing and Sharpening.								
	4.5. reading and writing of color images								
	4.6 Color image Segmentation								
	4.7 Extraction of R,G,B Components from color image using programming and equations								
	Chapter 5: Morphological Image Processing and Image segmentation	CLO3 and CLO4	7hr	-	6hr	-	4hr	10hr	27hr
	5.1 The Hit-or-Miss Transformation								

	5.2 Basic Morphological Algorithms								
	5.3 Gray-Scale Morphology								
	5.4 Point, Line, and Edge Detection								
	5.5 Thresholding								
	5.6 Segmentation Using threshold and Morphological Watersheds								
	5.7 Dilation and Erosion. - Opening and Closing.								
	Chapter 6: **Project based Image processing Applications**	CLO4 and CLO5	3hr	-	3hr	-	3hr	6hr	15hr
	6.1 Complex Wavelet transform image feature detection and image segmentation								
	6.2 Satellite , sonar, radar image segmentation to identify the road lines and blocks								
	6.3 K-Means, Fuzzy c means segmentation for CT SCAN medical imaging								
	6.4 EnFCM, FCM_S1 and FCM_S2 segmentation for cancer detection from MRI imaging								
	6.5 FLICM, FGFCM and NDFCM segmentation for noise reduction, detection of region of interest from MRI imaging								
	Total								100hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5	1hr		1hr
2	Lab	10	3hr	3hr	6hr
3	Project	10	1hr	7hr	8hr

		Presentation				
	4	Mid Exam	25	2hr		2hr
					Total	17hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			3hr		3hr
					Grand Total SLT	120hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	MATLAB Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Digital Image Processing Third Edition, by Rafael C. Gonzalez and Richard E. Woods
		2	Digital signal processing ,Fourth edition by JOHN G. PROAKIS , DIMITRIS G. MANOLAKIS
		3	Principles of Digital Image Processing, Advanced Methods,Wilhelm Burger, Mark J. Burge,2013
		4	Handbook of Image and Video Processing by Alan C. Bovik,2005
		5	Fundamentals of Digital Image Processing, A Practical Approach with Examples in Matlab, Chris Solomon, Toby Breckon,2011

Adama Science and Technology University						
1	School: Electrical Eng. & Computing		Department: Electronics & Communication Eng.			
2	Course Category	Major Elective				
	Course Name	Semiconductor Devices				
	Course Code:	ECEg5316				
3	Synopsis:	This course explores semiconductor physics, and operation & applications of semiconductor devices such as p-n junctions, BJTs, JFETs and MOSFETs. Also formation of metal -semiconductor is discussed.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	V	Year:	II	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Electronics circuit I (ECEg2201)				

8 Course Learning Outcome (CLO): At the end of the course the student will be able to do:

CLO1	Recall and define the basic knowledge about the physical principles and operational characteristics of Semiconductor Physics and their devices
CLO2	Understand the distribution of charge carriers and position of Fermi level inside the semiconductor material
CLO3	Understand the phenomenon of current flowing inside the semiconductor material using drift and diffusion mechanism
CLO4	Discuss the formation of P-N junction, derive the potential barrier and space charge width at equilibrium and nano equilibrium
CLO5	Explain the metal -semiconductor junction.Differentiate between the Schottky and ohmic contact

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)																	
	SO1	SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment						
								L	T	P	O	Test	Quiz	Test	Project	Lab report	Mid exam	Final exam
CLO1	√					√	√	√	√								√	√
CLO2	√		√					√	√			√	√				√	√
CLO3	√							√	√					√			√	√
CLO4												√		√				√
CLO5												√						√

Indicate the relevancy between the CLO and SO by ticking "√" on the appropriate relevant box

10 Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	MATLAB software
2	PSpice software
3	

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
<u>Chapter 1</u> **<u>Semiconductors in daily life:</u>**	CLO1	✓				✓	✓	**15 hr**
• Semiconducting material properties								
• Energy levels in atoms								
• Energy band formation								
• Bandgap and material								

	classification								
	• Electrons and holes								
	• Effective mass								
	Chapter 2: Carrier Properties	CLO2	✓				✓	✓	**20 hr**
	• Intrinsic carrier density								
	• Distribution of Charge Carriers								
	• Donor and acceptor impurities								
	• Fermi level in intrinsic and extrinsic semiconductors								
	• Position of Fermi Level								
	• Temperature dependence of carrier density								
	• Generation and recombination of carriers								
	Chapter 3: Carrier Transport:Drift and Diffusion	CLO3	✓				✓		**20 hr**
	• Drift Current density								
	• Mobility Effects								
	• Conductivity								
	• Velocity Saturation								
	• Diffusion carrier density								
	• Total current Density								
	• Excess Carrier Lifetime								
	Chapter 4: The P-N Junction	CLO4	✓				✓		**20 hr**
	• Basic structure of the PN Junction								
	• Zero Applied Bias : Built in Potential, space charge width								
	• Applied Bias : Space charge Width and junction capacitance								
	• One sided Junctions								
	• Non uniformly Doped Junctions								

	Chapter 5: Metal-Semiconductor Junction	CLO5	✓				✓		**20 hr**
	• Schottky Barrier junction current voltage relationships								
	• Ideal Junction Properties and nonideal effects on the barrier heights								
	• Comparison of Schottky barrier diode and the pn junction diode								
	• Metal Semiconductor ohmic contacts								
	• Homojunction and Heterojunctions								
	• Differentiation between Schottky and ohmic contact								
	Total								**95 hr**

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	5%	√		2 hr
2	Test	10%		√	9 hr
3	Mid exam	20%	√		2 hr
4	Project and Presentation	15%		√	9 hr
				Total	**22 hr**

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		√		**3 hr**
			Grand Total SLT	**120 hr**

L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face
Note: indicates the CLO based on the CLO's numbering in item 9.

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	PSpice Software
		2	Computer lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	D. Neamen and D. Biswas, "Semiconductor Physics and Devices", 4th edition, McGraw-Hill Education, 2013.
		2	B.G. Streetman and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson, 2016.
		3	S. M. Sze and K. K. Ng, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2007.

		4	A. S. Sedra and K. C. Smith, "Microelectronic Circuits: Theory and Applications", 6th edition, Oxford Press, 2013.
		5	S. Wang, Fundamentals of Semiconductor Theory & Device Physics, Prentice Hall, 1989

<table>
<tr><td colspan="14">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="7">College: CoEEC</td><td colspan="6">Department: ECE</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="12">Majore Elective</td></tr>
<tr><td>Course Name</td><td colspan="12">Digital Hardware Design</td></tr>
<tr><td>Course Code:</td><td colspan="12">ECEg5312</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="12">Digital System Design have become the prime medium of realization of modern Electronics Systems. The goal of the course is to study hardware description languages and describe their role in the electronic design automation environment. The course also focuses on Verilog basics and FPGA basics. This course also introduces the concepts and techniques of modern integrated circuit design and analysis along with optimization of combinational and sequential circuit using HDL languages. This course is one of the vital course for designing the processors and verifications.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="12"></td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td colspan="3">II</td><td>Year:</td><td colspan="3">V</td><td colspan="4"></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="12">3</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="12">Digital System Design (ECEg3201)
Microelectronics (ECEg3306)</td></tr>
<tr><td rowspan="6">8</td><td colspan="13">Course Learning Outcome (CLO): At the end of the course the student will be able to do:</td></tr>
<tr><td>CLO1</td><td colspan="12">Design combinational and sequential circuits using HDL Programming.</td></tr>
<tr><td>CLO2</td><td colspan="12">Design of various digital modules through project oriented approach</td></tr>
<tr><td>CLO3</td><td colspan="12">Identify the suitable Abstraction level for a particular digital design</td></tr>
<tr><td>CLO4</td><td colspan="12">Compare and analysis architectures of different FPGAs.</td></tr>
<tr><td>CLO5</td><td colspan="12">Development of prototype of circuit design</td></tr>
<tr><td rowspan="4">9</td><td colspan="13">Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:</td></tr>
<tr><td rowspan="3">Course Learning Outcomes</td><td colspan="12">Student Outcomes (SO)</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="5">Assessment</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Teaching Methods</td><td>Lab</td><td>Quiz</td><td>Project</td><td>Mid</td><td>Final Exam</td></tr>
</table>

		SO1	SO2	SO3	SO4	SO5	SO6	SO7	L	T	P	O					
	CLO1	√	√			√			√		√					√	√
	CLO2			√	√				√		√		√		√	√	√
	CLO3	√		√		√			√		√		√	√	√	√	√
	CLO4	√		√					√		√		√		√		√
	CLO5					√	√	√					√		√		√
	Indicate the relevancy between the CLO and SO by ticking "√"on the appropriate relevant box																

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Xilinx
	2	HDL Language
	3	Digital Design

11 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: **VHDL LANGUAGE**	CLO1	6hr		6hr		5hr	8hr	25hr
1.1 Modelling concepts. Levels of abstraction. Design methodologies. Basic concepts.								
1.2 Module, module header format. Lexical conventions: comments, identifiers, numbers, strings.								
1.3 Data types: nets, registers, vectors, arrays. Parameter types. Operators. Operator types, precedence								
Chapter 2: **Behavioral and Data Flow Modeling**	CLO2 and CLO3	6hr		6hr		5hr	8hr	25hr
2.1 Behavioral modeling. Behavioral modeling blocks: always block, event-based timing control,branch statements,								

	case, casex, casez.								
	2.2 Procedural assignments: blocking and nonblocking								
	2.3 Data flow modeling. Assign statements. Delays. Regular, implicit continuous assignment and net declaration delay.								
	2.4 Logic statement implementation. The conditional operator.								
	Chapter 3: **Gate and Switch Level Modeling and Looping**	CLO3 and CLO4	6hr		6hr		5hr	8hr	25hr
	3.1 Gate level modeling Gate delays. Specify block.								
	3.2 Switch level modeling. Primitives. Test bench creation. Initial block.								
	3.3 Looping constructs: while loop, for loop, repeat, forever loop. Tasks and functions.								
	Chapter 4: **FPGA Implementation**	CLO4 and CLO5	3hr		3hr		3hr	6hr	15hr
	4.1 Introduction, FPGA Architecture, Interconnects, FPGA Design flow,								
	4.2 System-Level Design, Different categorization of FPGAs,								
	4. Architecture study of some popular FPGA families.								
	Total								90hr

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Quiz	5%	√		2hr
	2	Lab	15%	√		1hr

	3	Mid exam	20%	√		2hr
	4	Project and Presentation	10 %		√	15hr
	Total					20 hr
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			√		3hr
	Grand Total SLT					113hr
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: indicates the CLO based on the CLO's numbering in item 9.					

12	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Simulation Room
		2	HDL software
		3	Computer Lab
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	M. Ciletti. Advanced Digital Design with the Verilog HDL. Prentice Hall; 2nd edition
		2	A VHDL Primer", Jayaram Bhasker, Pearson Education, 3rdEdition,2005
		3	S.Trimberger, Edr., Field Programmable Gate Array Technology, Kluwer Academic Publications VLSI Design:
		4	Verilog Digital System Design RT Level synthesis TestBench and verification by Zainalabedin Navabi
		5	"M. Mano, C. Ciletti. Digital Design: With an Introduction to the Verilog HDL. Prentice Hall; 5th edition, 2012"

Adama Science and Technology University						
1	College: COEEC			Department: ECE		
2	Course Category	Major (Mandatory)				
	Course Name	Final Year Project Phase-II				
	Course Code:	ECEg5202				
3	Name(s) of Academic Staff:	To be assigned				
4	Semester and Year offered:	Semester:	II	Year:	5	
5	Credit Hour:	4				
6	Prerequisite/ Co-requisite: (if any)	Final Year Project Phase I (ECE5207) and Capstone Project (ECE5205)				
7	Course rationale	This course is essential because it provides students an opportunity to apply the knowledge they have learnt, their intellectual abilities and practical skills to solve engineering problems. These problems may take the form of an investigation or the				

		development of engineering hardware, software or both.
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	
	CLO2	Design/simulate/develop prototype/system, correlation or model by considering different factors/constraints.
	CLO3	Write the final research document following standard research writing formats and present it in clear and understandable way for different range of audiences.
	CLO4	Demonstrate professional and ethical responsibilities and commitments.

9 Mapping of the course Learning Outcomes to the Student Outcomes, Teaching Methods and Assessment:

Course Learning Outcomes (CLO)	Student Outcomes (SO)															
		SO2	SO3	SO4	SO5	SO6	SO7	Teaching Methods				Assessment				
								L	T	P	O	Quiz/test	Assignment	Project	Progress-report	Oral presentation
															√	√
CLO1						√	√			√					√	√
CLO2	√	√								√					√	√
CLO3			√							√					√	√
CLO4				√						√					√	√

10	Transferable Skills (if applicable)	
	1	Students will acquire skills of good judgment, decision making and continual learning capacity building.
	2	Students will acquire skills of designing experimental setups, conducting experiment, data presentation, interpreting results, and draw persuasive conclusions.
	3	Students will acquire skills of executing independent task, managing research project and effective communication.
11	Course Synopsis:	This phase Two (II) final year project, led by a faculty member, focuses on individual research on chemical engineering problems. It includes complete literature review, comprehensive research work, designing, simulation, modelling, prototyping, interim report, data analysis, development of final research report, and presentation of final research project for public.

12 Distribution of Student Learning Time (SLT)

Course Content Outline/project activity	CLO	Teaching and Learning Activities						
		Guided learning (F to F)				Guided Learning (NF to F)	Independent Learning (NF to F)	Total (SLT)
		L	T	P	O			
Comprehensive literature review and data gathering.		0	0	0	0	2	8	10
Reinforcement of convenient research methods and strategies.		0	0	0	0	5	25	30
Detail designing and development of component/systems/products.		0	0	0	0	10	40	50
Conduct experiment, testing, analyzing data and Validating		0	0	0	0	10	30	40

	Final research writing and report preparation		0	0	0	0	2	8	10
	Total		0	0	0	0	29	111	140
	Assessment								
	Continuous Assessment	Percentage Total-100(%)	F to F	NF to F	SLT				
	1 Interim Reports	20	3	6 (preparation)	9				
	2 Seminar/progress presentation	30	3	5 (preparation)	8				
	3 Final research public defense	50	1	2 (preparation)	3				
	Total				20				
	Grand Total SLT				160				
	L = Lecture, T = Tutorial, P = Practical, O = Others, F to F = Face to Face, NF to F = Non Face to Face								
13	Special requirements and resources to deliver the course.	• Workshop and laboratory is required for project work • Software, computer and simulation room is needed to simulate and design project works.							
14	Text book and reference:	• Relevant books, research Journal articles, workshop and conference papers related to the ongoing research problem areas. • Faculty members • ASTU's Senior Project guideline							

11. Summary of Course to SO Mapping

SO / Courses	SO1	SO2	SO3	SO4	SO5	SO6	SO7
Applied Mathematics I	√						
General Physics	√	√	√				√
General Chemistry	√						
Introduction to Computing	√	√					
Communicative English Skills						√	

Introduction to Ethics & Citizenship studies						√		
Health and Physical Education I	√				√	√		
Applied Mathematics II	√							
Introduction to Emerging Technologies	√			√				√
Fundamentals of Programming	√	√	√					
Logic and Critical Thinking					√	√		
Engineering Drawing		√	√					
Basic Writing Skill						√		
Health and Physical Education II	√				√	√		
Applied Mathematics III	√							
Electronic Circuit I	√				√	√	√	
Fundamentals of Electrical Engineering	√	√			√	√	√	
Data Structures & Algorithms	√	√	√	√		√		√
Geography of Ethiopia and the Horn								
Electronic Circuit II	√	√	√			√	√	
Signals and System Analysis	√	√				√	√	
Electromagnetic Field	√				√		√	
Engineering Application Software	√	√					√	
Computational methods	√				√	√	√	
Linear Algebra	√			√				
Digital Logic Design	√	√	√	√	√	√	√	
Network Analysis and Synthesis	√	√				√		
Probability and Random Processes	√	√				√		
Digital Signal Processing	√	√						

General Psychology and Life Skills					√	√	
Applied Modern Physics	√	√		√	√		√
Introduction to Communication Systems	√	√		√		√	√
Solid State Physics	√	√	√	√		√	√
History of Ethiopia and the Horn (not mapped)							
Microelectronic devices & circuits	√	√	√	√	√		
Optoelectronics	√	√				√	√
Object Oriented Programming	√	√	√		√		
Introduction to Artificial Intelligence	√	√				√	
Introduction to control System	√	√			√	√	√
Introduction to Electrical Machines	√	√	√	√	√	√	√
Computer Architecture and Organization		√				√	√
Digital Communication	√	√	√				
EM Waves and Guide Structure	√	√			√	√	
Entrepreneurship and Business Development						√	
Engineering Research and Development Methodology	√	√	√	√	√	√	√
Introduction to power systems	√	√			√	√	√
Electrical Measurement and Instrumentation	√	√	√	√	√	√	√
Microprocessor and Interfacing	√		√			√	√
Antenna and Radio Wave Propagation	√	√	√				

Data Communication and Computer Networks	√	√				√	√
Introduction to Economics				√	√		
Integrated Engineering Team Project		√	√		√		
Microwave Devices and Systems	√	√				√	√
Integrated Circuit Technology	√		√			√	√
Industry Internship - II	√	√	√	√	√	√	√
Wireless and Mobile Communication	√	√	√			√	√
Capstone Project	√	√	√	√	√	√	√
Final Year Project Phase I	√		√	√		√	
VLSI	√	√	√		√	√	√
Advanced Computer Networks	√		√			√	√
Embedded and real time systems	√	√			√		
Programmable Logic Controllers and Robotics	√	√	√	√	√	√	√
Biomedical Instrumentation and Analysis	√	√		√	√	√	√
Power Electronics	√	√	√	√	√	√	√
Project Management for Engineers	√	√	√	√	√	√	√
Optics and Optical Communication	√	√	√	√	√	√	√
Satellite Communication	√					√	√
Analysis & design of Digital integrated Circuit	√	√	√	√	√	√	√
Telecommunication Networks and Switching	√	√	√			√	√
Introduction to Computer Vision		√	√	√		√	√
Digital Image Processing		√	√	√		√	√

Semiconductor Devices	√		√			√	√
Digital Hardware Design	√	√	√	√	√	√	√
Final Year Project Phase II	√	√	√	√		√	√
Total	60	48	34	25	31	51	41
Percentage (%)	80.0 %	64.0 %	44.0 %	32.0 %	42.7 %	68.0 %	56.0%