Adama Science and Technology University

"We are dedicated to innovative knowledge"

School of Electrical Engineering and Computing (SoEEC)

Department of Computer Science and Engineering (CSE)

Curriculum
For
Undergraduate Software Engineering Program

October, 2020

Adama,

Ethiopia

List of Acronyms

ASTU	Adama Science and Technology University
SoEEC	School of Electrical Engineering and Computing
CSE	Computer Science and Engineering
SEng	Software Engineering
ASQAC	Academic Standards and Quality Assurance Committee
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
ICT	Information and Communication Technology
OBE	Outcome Based Education
PEO	Program Educational Objective
PLO	Program Learning Outcome
PO	Program Outcome
QMS	Quality Management System
SLT	Student Learning Time
SMC	School Managing Council

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1. Introduction

1.1 Background of ASTU

The present Adama Science and Technology University (ASTU) was at first established in 1993 as Nazareth Technical College (NTC) to offer degree and diploma level education in technology fields. Later, the institution was renamed as Nazareth College of Technical Teachers Education (NCTTE), to train candidates who would become technical teachers for TVET colleges/schools across the country. In May 2006, the university was inaugurated as Adama University. The full-fledged university started opening additional academic programs in other areas as an extension to its original mission. Later, it became the only model technical university in Ethiopia led by a German professor. During this time, the university had seven (7) different schoolsnamely, *School of Business*, *School of Engineering and Information Technologies*, *School of Humanities and Law*, *School of Natural Sciences*, and *School of Educational Science and Technology Teachers Education*, *School of Agriculture and School of Health and Hospital*. Of these, the last two schools were located at Asella branch while the rest were in the main campus. In May 2011, the *School of Business*, *School of Agriculture and School of Health and Hospital* were reduced from Adama University to form Arsi University located in Asella and Adama University was renamed as Adama Science and Technology University (ASTU).

Adama Science and Technology University, ASTU, is one of the two national science and technology universities articulating and affirming the fundamental values and purposes of science and technology in the rapidly changing world. Following its renaming by the Council of Ministers as Adama Science and Technology University in May 2011, the university has started working towards the attainment of becoming a center of excellence in science and technology, thereby allowing for the realization of goals set in the Growth and Transformation Plan (GTP).

After ASTU has launched transformation, its academic wing has been restructured into five schools named as *School of Applied Natural Science (SoANS)*, *School of Civil Engineering and Architecture (SoCEA)*, *School of Electrical Engineering and Computing (SoEEC)*, *School of Mechanical, Chemical and Materials Engineering (SoMCME)* and *School of Humanities and Social Science (SoHSS)*. The wing has also Division of Freshman Coordination (DoFC) where the students stay for one year to take university required courses. As strategic institute, ASTU's school and their respective departments/programs are reestablished in such a way to support the eight centers of excellence endorsed by the former Ministry of Science and Technology to achieve their national goal.

Focused on strategic direction of Ethiopian development, all schools of the University is working aggressively to produce qualified, competent, and socially responsible professionals in the fields of science and technology through promoting research oriented Science and Technology. To achieve this, the curricula of the undergraduate programs are revised and/or designed 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.

1.2 Vision and Mission of the ASTU

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.

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.

1.3 Overview of School of Electrical Engineering and Computing (SoEEC)

The direction and the required speed of growth and transformation of the country demands Science and Technology universities such as Adama Science and Technology University (ASTU) to play an active role in the country’s rapid transformation process. This is due to the fact that the Ethiopian government, as stipulated in its forthcoming Growth and Transformation

Plan (GTP II), is committed to turn its growth direction from agriculture-led to industry-led economy, where science, technology, and innovation are deemed decisive in the nation's economic growth and sustainable development.

School of Electrical Engineering and Computing, one of the five schools of ASTU, has been established to promote innovative research that is geared towards learning, adaptation and development of suitable technologies and that encourages value addition to indigenous resources through industrial processing in Electrical Engineering and Computing thematic areas. The school has four programs, namely: *Computer Science and Engineering (CSE)*, *Electronics and Communication Engineering (ECE)*, *Electrical Power and Control Engineering (EPCE)* and the newly established *Software Engineering (SE)*.

The undergraduate programs of the SoEEC aim to pursue academic excellence and foster Science and Engineering talents who will contribute to Ethiopia by leading the most advanced technology in each respective area of the available programs and may be to programs that will be launched in the near future. To this end, the programs in SoEEC offer high-quality basic and advanced courses to help students to obtain broad knowledge and expertise in all major fields of each program that prepares them to take more advanced courses in their graduate studies and enables them to be the first choice in the leading position in industry and research.

1.4 Computer Science and Engineering Department (CSE)

1.4.1 Programs in CSE Department

The new program structure of the department would look like as follows:

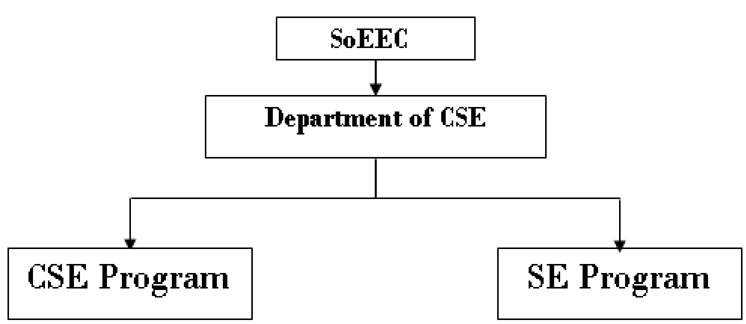

Figure 1: The CSE Department Program Structure

1.4.1.1 Computer Science and Engineering Program

The Computer Science and Engineering (CSE) major at ASTU is a merger of Computer Science and Computer Engineering which is structured in a way that supports the study of both theoretical and engineering aspects of computers. It finds balance between breadth and depth to provide a solid foundation in the basic science and mathematics on one hand, and comprehensive exposure to societal issues, professionalism, and leadership skills on the other.

Students are guided to pursue their interest in computer science and engineering by studying the fundamental scienceand the application of engineering concepts, techniques, and methods to both computer systems engineering and software system design through major required courses such as data structures, discrete mathematics, algorithms, object-oriented programming, programming languages, fundamental of electrical engineering, etc. followed by tailored individual education through the selection of major elective courses. The general unrestricted elective option provide context with significant background in one or more of the natural sciences and other engineering disciplines.

Every senior student is required to undertake a research project under the guidance of a senior academic advisor. Students are encouraged to participate in an independent research supporting the ongoing researches or projects in the school.

1.4.1.2 Software Engineering Program

The Software Engineering major in ASTU is based on mathematical and computing fundamentals, it guide students in to the engineering aspects of a software development through courses in software engineering like software architecture and design, software testing and quality assurance, software evolution and maintenance, software integration and engineering. In addition, the carefully designed elective courses and mandatory courses will give students a choice of application domains including gaming and animation, artificial intelligence, computer security, system engineering, and computer vision.

2. Background of Software Engineering Program

The Computing field of study includes Software Engineering, Computer Science, Information Technology, Information Systems and Computer Engineering as per the ACM standard classification of field of studies in Computing. There are global experiences of merging Computer Science and Computer Engineering programs and offers it as a program in Computer Science and Engineering. ASTU followed the merging of both Computer Science and Computer Engineering resulting Computer Science and Engineering (CSE) as a department as well as a program based on other countries approach like South Korea. However, we see it from the perspective of expectation of Industry and our customers from the need assessment result, this program does not sufficiently address the Software Engineering demand to make students a full-fledged Software Engineers. So the new Software Engineering program is designed in such a way that it has some commonality with Computer Science and Engineering, which mainly focuses on algorithmic design and Computer Hardware aspects but its own sufficient specialty focus area.

The Software Engineering Major program as part of the Computer Science and Engineering Department is designed in a way to equip students with core competencies of computing, software and engineering. Software Engineering program focuses on engineering of software systems that meet the requirements, design and build while keeping the quality of service within budget and time (schedule) requirement.

The Software Engineering program is based on mathematical and computing fundamentals, it guide students in to the engineering aspects of a software through courses in software engineering like software architecture and design, software testing and quality assurance, software evolution and maintenance, software integration and engineering. In addition, the carefully designed elective courses and mandatory courses also will give students a choice of application domains including gaming and animation, artificial intelligence, computer security, system engineering, and computer vision.

The Bachelor of Science Degree in Software Engineering provides graduates with quality *education*, *training* and *skills* thatcan enable them to become successful professionals in the software industry.

2.1 Curriculum Design Process

In the recent years, Ethiopia has developed and implemented different types of development plans that targets the transformation and industrialization of our existing agricultural-based economy. To this end, the Government of Ethiopia had already implemented the First Growth and Transformation Plan (GTP I) and it is on implementing the Second Growth and Transformation Plan (GTP II). One of the main goals of the GTP II is the transformation of the economy from agricultural-based to industry-lead economy. Currently, most of the industries in Ethiopia are used manual systems to operate, control and monitor the production and to distribute their products. In order to modernize the production line and the service delivery of the industries and other organizations; automation can play a great role. The automation of these industries and organizations can be achieved by training well-qualified Software Engineers and others related domain Engineers. Currently, the demand of Software Engineers who can operate under very dynamic and challenging environment is increased globally and nationally from time to time.

Adama Science and Technology University and Computer Science and Engineering (CSE) department had conducted a study to investigate the demand of Software Engineers at the National and International level. The result of the study indicated that Software Engineers are highly demanded in Ethiopia as well as all around the world. The department of CSE interviewed a number of peoples who worked in the area from different domains like: *Institutions*, *Software development companies*, *communication companies*, *Broadcast Media*, *Banks* etc. Beside this, eight governmental and one private universities UG program Software Engineering curriculum is examined to learn from their curriculum strength and weakness. Most importantly, the University of Texas at Dallas and Monmouth University are considered as a bench mark university since they have the Software Engineering programs that are accredited by ABET. ASTU also has a plan to be accredited by this non-profit organization.

To fill these gaps in the qualified software engineers, it becomes necessary to open a new UG program in Software Engineering at Adama Science and Technology University (ASTU). The new program is a five-year undergraduate study program where the trainees will learn technical and practical competences related to the efficient design and development of reliable software systems. The curriculum encompasses all important aspects of software engineering, including:

requirements engineering, software architecture and design, software development, software testing and quality assurance, software maintenance, software project management and others software engineering knowledge areas as it is recommended in the IEEE/ACM godliness for Software Engineering curriculum.

2.2 Rational of the Program

The rationale behind the lunching of the Software Engineering program is the prevailing conditions in the Country with respect to the needs for professionals in this area. The driving forces of launching Software Engineering program in ASTU's CSE department include:

1. The countries ambition to become among the middle income counties by 2025,
2. Country's opening the previously public owned sectors and firms to both foreign and local private investors,
3. The expectation of the country that service sectors and industries will take the lead through time,
4. Dynamic technological changes and challenge to keep pace with it,
5. Globalization and the need to compete in digital economy in the globalized world.

Digital transformation is one enabler to fulfillment the above mentioned forces in the near future. To accelerate the digital transformation, we need focus on excelling computing field of studies in general and Software Engineering particular. Therefore, it is the right time for ASTU to launch a Software Engineering program in the manner that can produce skilled human power to fit an serve in the transformed digital economy and to fill the gap of highly skilled human power in the field of computing.

2.3 Vision, Mission and Values of the Program

Vision

To be distinguished in teaching, learning, scientific research and community service according to the international standards.

Mission of the Software Engineering Program

The Software Engineering program strives to:

1. Prepare graduates who are well-equipped with knowledge, skills and values and who are highly motivated to lifelong learning and capable of fulfilling contemporary requirements.

2. Foster academic research and graduate studies and support innovation plans.

3. Establish a productive partnership with local community.

Values

Fairness	Dealing fairly with all and respecting individual's values, dignity and legitimate freedom.
Transparency	Dealing clearly in all department procedures with students, academic and administrative staff.
Integrity	Full compliance with professional morals and ethics.
Belongingness	Having a sense of responsibility toward the department, local community and nation.
Co-operation	Group work among all department staff and students in all department procedures.
Innovation	Accommodating innovative ideas and solutions in teaching and learning as well as academic research fields.
Professionalism	The ability to demonstrate knowledge, skills and capability in disciplines.

Benchmarks: The Software Engineering program gives students the opportunity to:

1. Study a body of knowledge relating to Software Engineering, Software reengineering, and maintenance;

2. Understand the principles of large scale software systems, and the processes that are used to build them;

3. Have skills in the most widely used approach to software construction – object-orientation (OO), including OO requirement specifications, OO analysis, OO design, OO programming, OO testing and maintenance;

4. Use tools and techniques for producing application software solutions from informal and semi-formal problem specifications;

5. Acquire and develop many valuable skills such as the ability to use computer aided Software Engineering tools to analyze, evaluate, select and synthesize information sources for the purpose of developing a software system;

6. Develop an appreciation of the cost, quality, and management issues involved in software construction;

7. Develop an awareness of the role and responsibilities of the professional software engineer;

8. Acquire skills to think about problems and their solutions using appropriate methods of analysis and design;

9. Be able to design and communicate ideas about software system solutions at different levels of abstraction and have the opportunity to transfer such skills across a wide range of industrial and commercial domains;

10. Have an ability to work with other people in a team, communicating computing ideas effectively in speech and in writing;

11. Have a basis for going on to further study in software engineering, or for finding work in computing-related industries.

12. Be a graduate that can go on to employment in technical positions in software houses and with large-scale scientific and engineering users;

13. Be graduate that may seek to pursue research careers.

2.4 Program Educational Objectives (PEOs)

PEOs describe accomplishments that a graduate is expected to perform and attain/achieve in the first few years after graduation. In brief, PEOs describe the required expertise, engagement, learning, leadership and teamwork of the graduates in 3 to 5 years after graduation. **Table 1** contains the PEO of the Software Engineering program.

Table 1: Program Educational Objectives (PEOs)

PEO	***Statement***
PEO-1	Graduates will obtain general scientific and engineering knowledge, practical skills and general competences that make them confident to develop high-quality software solution in various application domain to meet the needs of industry and academia;
PEO-2	Graduates will communicate effectively as SE professionals with users, peers and upper management ethically and proactively;
PEO-3	Graduates will demonstrate an understanding of the importance of life-long learning, professional development and pursue postgraduate studies and succeed in academic and research careers;
PEO-4	Graduates will develop progressively managerial, reading, and influential roles in their work area and in the communities while solving community problems.

2.5 Mapping of PEO with University Mission

The following Table shows the mapping of PEO to the university mission which indicates the responsiveness of the Software Engineering program to the expressed interest of various stakeholders.

Table 2: Mapping of PEO with University Mission

	M1	***M2***	***M3***	***M4***

PEO-1	√			
PEO-2		√		
PEO-3				√
PEO-4			√	

2.6 Program Outcomes (POs)

Table 3 lists the Program Outcomes (POs) of the Software Engineering program, which have been adopted from ABET's Computing Accreditation Commission (CAC) and Engineering Accreditation Commission (EAC) criteria. Upon completion of the program, the graduates should have the following PO:

Table 3: Program Outcome for Software Engineering Program

PO	Statement
PO-1	Ability to identify, formulate, analyze, and solve complex computing or engineering problems by applying principles of computing, engineering, science, and mathematics.
PO-2	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.
PO-3	An ability to communicate effectively with a range of audiences.
PO-4	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.
PO-5	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.
PO-6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
PO-7	Cultivate the field of computing and its latest trends, to pursue teaching, research and development activities using appropriate learning strategies
PO-8	An ability to use the techniques, skills, and modern engineering tools and processes necessary for software engineering practice to maintain legacy software systems and to develop new software systems
PO-9	An ability to apply software engineering perspective through software design and construction, requirements analysis, verification, and validation, to develop solutions to modern problems such as security, data science, and systems engineering that meets the automation needs of the society and industry

2.7 Mapping of PO with PEO

Table 4 depicts how the above POs of the program are mapped with the PEOs to clearly indicate/reflect the responsiveness of the program outcome to the PEOs based on the expressed interest of program stakeholders.

Table 4: Mapping of PO with PEO

	PEO-1	***PEO-2***	***PEO-3***	***PEO-4***
PO-1	√			
PO-2				√
PO-3		√		

PO-4		√		
PO-5				√
PO-6	√			
PO-7			√	
PO-8	√			
PO-9	√			

2.8 Degree Nomenclature

The degree awarded to a student who has fulfills all the requirements is

Bachelor of Science (BSc.) Degree in Software Engineering

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2.9 Duration of Study

The duration for study of the program shall be five years. For dual major/minor there may be one year extension as stated in the university senate legislation August 2017, Article 98.1.

3. Program Requirements

3.1 Admission Requirements

Students who have scored pass marks in the national level university entrance examination and then fulfilled the criteria set by the Ministry of Science and Higher Education to join Adama Science and Technology University are enrolled to the university. Then after successful completion of the University requirement courses that should be given for one year, the students are allowed to join the School of Electrical Engineering and Computing.

The current admission requirement into the program is the successful completion of the school requirement courses given for one semester. Then, the students are admitted into the Software Engineering program.

3.2 Graduation Requirements

The minimum credit hours required for graduation is **180** and overall cumulative grade point average (CGPA) must be at least 2.0 for successful completion from the program as specified in the senate legislation.

3.3 Total Credit Requirements

Table 5 summarizes the total credit requirement of the Software Engineering program:

Table 5: Total Credit Requirement

General	***Basic***	***Major***			***Free Electives***	***Total***
		M	**E**	**ST**		
27	47	70	33	103	**3**	180

M = Mandatory **E = Electives** **ST = Sub Total**

4. Teaching – Learning Methods and Assessment

4.1 Teaching – Learning / Instructional Methods

The teaching and learning methods used to offer the courses will be determined by the nature of the course; which has been indicated in course syllabus that include student centered teaching learning techniques 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.

4.2 Assessment and Evaluation Mechanisms

Various assessment and evaluation mechanisms will be employed to check whether the CLOs and POs have been achieved or not. As indicated in each of the syllabuses, assessment methods such as continuous assessments (test, quiz, assignments , mid exam) , report about an internship, ,group or individual projects, summative assessment(final exams), senior project, individual and group presentations etc., will be used based on the course nature and the CLOs in the course.

4.3 Grading System

Examinations are graded on a letter grading system as stated in the university senate legislation August2017, Article111. However, the grading system for industrial attachment/internship/and physical education 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%)	***Corresponding Letter 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)

Various mechanisms such as student, staff and stakeholders feedback schemes; procedures for innovation and improvement of the curriculum, standards and quality of teaching, learning and student performance will be used to manage the quality of the program.

Quality Management Systems Planning and Implementation for OBE will be established in our department based on the guideline and suggestion of academic standard and quality assurance (ASQA) directorate of the University as it has the mandate to prepare a different guideline to establish a quality management system in the university. Our quality management systems will have the following components as depicted by **Figure 2**.

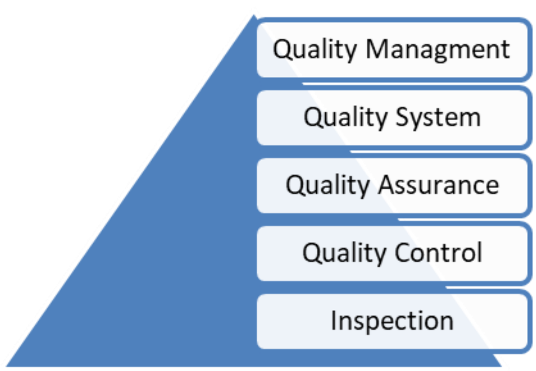

Figure 2: Quality Management System Components

Our commitment to continuous quality improvement is accomplished through a continuous quality improvement (CQI) cycle in which the department adopts a systematic comparison of its performance to its purpose to evaluate its effectiveness. Figure 2 and 3; illustrate the overall outcome-based education implementation strategies practiced at our department and its quality management process 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 course level (CLO) is evaluated and assessed every semester, while the PO attainment at the program level is conducted every year. The PEO assessment, evaluation and revision will be done every five years.

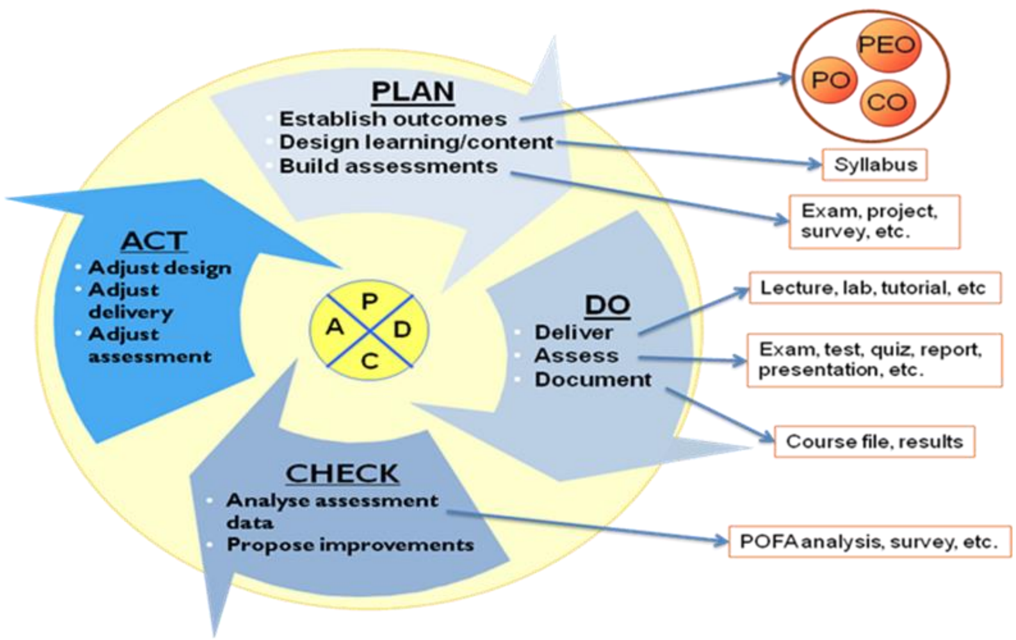

Figure 3: Overall OBE Implementation Strategy

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

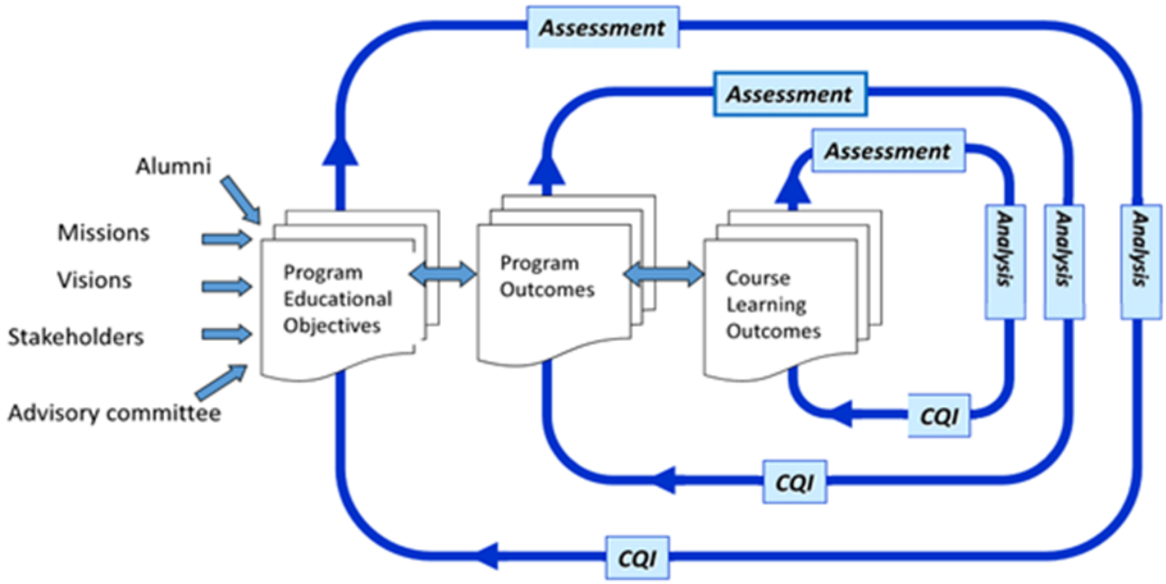

Figure 4: Continual Quality Improvement Cycle

6. Resources

6.1 Human Resource / Staff Profile

Table 7: Staff Profile

No.	*Academic Rank*	*Number of Staff*		*Subtotal*
		Male	*Female*	
1	Professor	2	0	2
2	Professional Engineers	-	-	-
3	Associate Professor	3	0	3
4	Assistant Professor	11	1	12
5	Senior Lecturer	2	-	2
6	Lecturer	26	4	30

7	Academic and Research Assistant(ARA)	11	0	11
8	ASTU Sponsored MSc Students (Contract based ARA)	3	6	9
	Supportive Staff	1	2	3
Total				**71**

6.2 Material Resources and Facility

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

6.2.1 Libraries

Central Library for all ASTU department students with access of books and electronic resources.

6.2.2 Laboratories

Total Number of Computer Laboratoriesare 31 (Thirty One)

15 Lab rooms on B-510

8 Computer Labs on B-508

8 Computer Labs on B509

25 out of 31 Computer labs are reserved for Practical/laboratory class

6 out of 31 Computer labs are reserved for Special Interest Groups (SIGs)

1 Out of 31 Computer lab reserved for ICPC

On Average there are 25 computers in each laboratory room. Therefore,

31 labs * 25 PCs = 775 PCs in Labs

All PCs in the mentioned labs has Internet Connection

6.2.3 Equipment and Tools

The following equipment and tools are available to support the practical session of some of the courses: Network toolkit (Crimper, cutter, tester), UTP Cables cat6e and RJ45 for networking courses, Computer maintenance materials/tools for maintenance and troubleshooting purposes.There arealso surveillance cameras around labs and Offices for security purpose

6.2.4 Offices

The department has 40 Offices located on two buildings (B508 and B509) for all faculty members

7. Course Plan

7.1 Course Code and Numbering

The course coding follows the standard provided by ASQAC as stated in the senate legislation August 2017, Article 87. The four characters (**SEng**) represent the course offering program name and followed by **four digits where:**

- The first digit represents **Year of Study**
- The second digit represents **Course Category**:
  - 0 General courses,
  - 1 Basic courses,
  - 2 Major Mandatory Courses, and
  - 3 Major Elective courses
- The third and fourth digit indicates **Semesterof course** delivery and **Sequence of courses**:
  - **odd** for first semester;
  - **even** for second semester and
  - **1** for summer semester.
- **<u>For example</u>**: "**SEng4201**" – refers to major mandatory course offered 4th year 1st semester.

7.2 Course Design and Category

7.2.1 Course Design

According to the senate legislation August 2017, Article 100, the number of credits required to taken by students joining a five year program shall be a minimum of 150Cr.Hrs. and a maximum of 180Cr.Hrs. Moreover, the credit hour of major courses shall be 80%. Accordingly under normal circumstance the five year Software Engineering regular program shall have the following semester credit hours requirements described as in **Figure 5**.

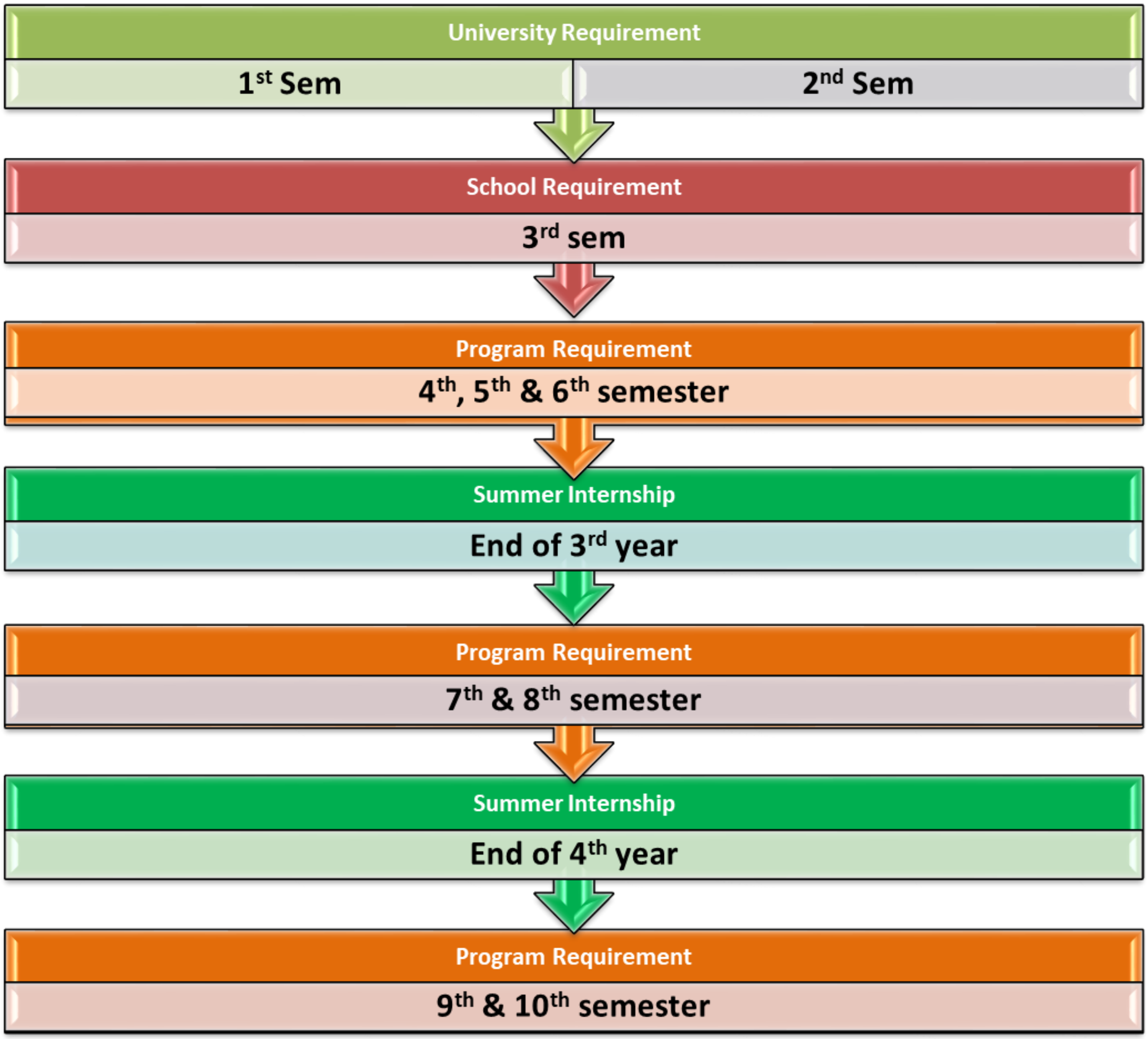

Figure 5:Structures of Undergraduate Software Engineering Regular Program

7.2.2 Course Category

Courses are categorized as follows: General Requirements, Basic Requirements, Major Requirements and Free Electives as shown in ***Figure 6***.

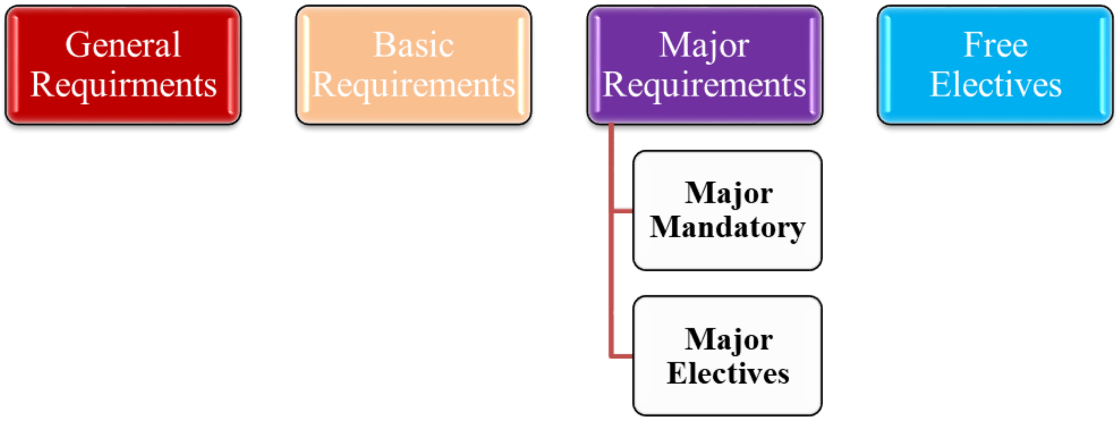

Figure 6: Course Categories

General Requirements

General requirements are Humanities, Arts, Social Science and Business courses which are national requirements all students must take. The total number of required credits is **27**.

Basic Requirements

Includes applied science courses that need to be completed for all majors and a few courses that apply to certain majors only. The total number of required credits is **47**.

Major Mandatory

All students must meet major requirements in order to complete a major program. The total number of required credits is **70**.

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 adviser and department when planning their program and selecting courses. The total number of required credits is **33**.

Free Electives

A student can take any courses from any undergraduate programs of the University. However, consultation with the expected advisers is highly recommended. The total number of required credits is **3**. The following **Table 8** summarizes credit requirement per category and course level.

Table 8: Credit Requirements per Course Category and Course Level

No	***Course Category***		***Course level***	***Credit Requirement***	***Percentage***
1	General	Mandatory	University required	27	15%
2	Basic	Mandatory	School required	47	26.1%
	Major	Mandatory	Department required	70	38.9%
		Elective		33	18.3%
3	Free Electives			3	1.7%
Total				**180**	**100%**

7.3 List of Courses

The lists of courses under each category are described in the following tables:

Table 9: List of General / University Required Courses

General/University required					
No.	***Course Code***	***Course Title***	***Cr.Hr.***	***ECTS***	***Prerequisite***
01	SOSC5003	Entrepreneurship and Business Development	3	5	None
02	EnLa 1001	Communicative English	3	5	None
03	EnLa-1002	Basic Writing Skills	3	5	None
04	LART 1001	Introduction to Civics and Ethics	3	5	None

05	LART 1002	Logic and Critical Thinking	3	5	None
06	SOSC2002	Introduction to Economics	3	5	None
07	LART 2002	General Psychology and Life Skills	3	5	None
08	HPEd 1011	Health and Physical Education I	P/F	_	None
09	HPEd 1022	Health and Physical Education II	P/F	_	None
10	LART 1004	Geography of Ethiopia and the Horn	3	5	None
11	LART 1003	History of Ethiopia and the Horn	3	5	None
Total			**27**	**45**	

Table 10: List of Basic Courses

Basic Courses					
No	***Course Code***	***Course Title***	***ECTS***	***Cr.Hr. (L-T-P)***	***Pre-requisite***
1	Math1101	Applied Mathematics I	6	4(3-1-0)	None
2	Math1102	Applied Mathematics II	6	4(3-1-0)	Math1101
3	Math2101	Applied Mathematics III	6	4(3-1-0)	Math1102
4	Phys1101	General Physics	5	3(2-3-0)	None
5	Chem1101	General Chemistry	5	3(3-0-0)	None
6	CSEg1102	Introduction to Emerging Technologies	5	3(3-0-0)	None
7	CSEg1101	Introduction to Computing	5	3(2-0-3)	None
8	EPCE2101	Fundamentals of Electrical Engineering	6	4(2-3-3)	Math1101
9	ECEg2101	Electronic Circuit I	6	4(2-3-3)	Co-req: EPCE2101
10	CSEg1104	Fundamentals of Programming	5	3(2-0-3)	CSE1101
11	CSEg2101	Data Structures & Algorithms	5	3(2-0-3)	CSEg1102
12	CSEg2210	Discrete Mathematics for Computer Science	5	3(3-0-0)	Math1101
13	ECEg4102	Probability and Random Processes	5	3(3-0-0)	Math1102
14	MENg1032	Engineering Drawing	5	3(2-3-0)	
Total				**47**	

Table 11: List of Major Mandatory Courses

Major Mandatory Courses					
No	**Course Code**	**Course Title**	**ECTS**	**Cr.Hr. (L-P-T)**	**Pre-requisite**
1	SEng2202	Object Oriented Programming	5	3(2-3-0)	CSEg1104
2	SEng2204	Computer Architecture & Organization	5	3(2-3-0)	CSEg1101
3	SEng2206	Fundamentals of Software Engineering	5	3(3-0-0)	None
4	SEng2208	Database Systems	6	4(3-3-0)	None
5	SEng3200	Industry Internship – I	0	9(P/F)	SSC
6	SEng3201	Software Requirements Engineering	5	3(2-3-0)	SEng2206
7	SEng3202	Engineering Web Based System	5	3(2-3-0)	CSEg1101
8	SEng3203	Formal Methods in Software Engineering	5	3(3-0-0)	SEng2102
9	SEng3204	Software Architecture and Design	5	3(2-3-0)	SEng3201
10	SEng3205	Data Communication & Computer Networks	6	4(3-3-0)	CSEg1101
11	SEng3206	Mobile Application Design and Development	5	3(2-3-0)	SEng2202
12	SEng3207	Operating Systems	6	4(3-3-0)	SEng2204
13	SEng3208	Programming under Unix/ Linux Lab	4	2(0-3-0)	SEng3207
14	SEng3209	Advanced Programming	5	3(2-3-0)	SEng2202
15	SEng4200	Industry Internship – II	0	9(P/F)	SSC
16	SEng4201	Software Testing and Quality Assurance	5	3(2-3-0)	SEng2206, SEng3204
17	SEng4203	Software Evolution and Maintenance	5	3(2-3-0)	SEng2206
18	SEng4204	Software Process and Project Management	5	3(3-0-0)	SEng2206
19	SEng4205	Computer Systems Security	5	3(2-3-0)	None
20	SEng4206	Engineering Research and Development Methodology	4	2(2-0-0)	None
21	SEng4208	Introduction to Artificial Intelligence	5	3(2-3-0)	None
22	SEng5201	Senior Project I	5	3(0-3-0)	SSC
23	SEng5202	Senior Project II	5	3(0-3-0)	SEng5201

24	SEng5203	Ethics and Professionalism in Computing	4	2(2-0-0)	None
25	SEng5204	Introduction Software Integration and Engineering	5	3(2-3-0)	SEng2206
Total				**69**	

Table 12: List of Major Elective Courses

Major Elective Courses					
No	***Course Code***	***Course Title***	***ECTS***	***Cr.Hr. (L-P-T)***	***Pre-requisite***
1	ECEg3201	Digital Logic Design	6	4(2-3-1)	ECEg2101
2	ECEg3304	Microprocessor and Interfacing	5	3(2-3-0)	ECEg3201
3	SEng4302	Embedded System and Robotic Control	5	3(2-3-0)	CSEg1102
4	SEng3301	Information Storage and Retrieval	5	3(2-3-0)	SEng2208
5	SEng4304	Human Computer Interaction	5	3(2-3-0)	None
6	SEng5303	Introduction to Natural Language Processing	5	3(2-3-0)	None
7	SEng3304	Implementation of Modern operating system	6	4(2-3-1)	SEng3208
8	SEng3306	Compiler Design	5	3(2-3-0)	None
9	SEng5305	Introduction to Machine Learning	5	3(2-3-0)	None
10	SEng5302	Introduction to Big Data Analytics	5	3(2-3-0)	None
11	SEng3303	Computer Graphics	5	3(2-3-0)	SEng1104
12	SEng5301	Introduction to Computer Vision and Image Processing	5	3(2-3-0)	None
13	SEng4307	Introduction to Computer Gaming and Animation	5	3(2-3-0)	SEng3303
14	SEng4303	Introduction to Systems Engineering	5	3(2-3-0)	None
15	SEng4306	Blockchain and Cryptocurrency	5	3(2-3-0)	SEng4205
16	SEng5304	Agile and Test Driven Development	5	3(2-3-0)	SEng3204
17	SEng5306	Component Based Software Development	5	3(2-3-0)	SEng3204
18	SEng3308	Advanced Networking	5	3(2-3-0)	SEng3205

19	SEng4305	Distributed Software Systems	5	3(2-3-0)	SEng3207
20	SEng4308	Fundamentals of Cloud and Edge Computing	5	3(2-3-0)	SEng4305
21	SEng5307	Digital Forensics	5	3(2-3-0)	SEng4205
22	SEng5308	Data and Application Security	5	3(2-3-0)	SEng4205
23	SEng5310	Introduction to Cyber Security	5	3(2-3-0)	SEng4205
Max Credit Hour				**33**	

Table 13: List of Free Elective Courses

No.	***Course Code***	***Course Title***	***Cr. Hr. (L-T-L)***	***Prerequisite***
1	Of Selected Course	Free Elective I	3(-, -, -)	Prerequisite of selected course
Total			3	

7.4 Course Breakdown for Regular Program

Table 14: Course Breakdown for Regular Program

Year I, Semester I								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	Math1101	Applied mathematics I	4	6	3	1	0	None
2	Phys1101	General Physics	3					None
3	Chem1101	General Chemistry	3					None
4	CSEg1101	Introduction to Computing	3					None
5	EnLa 1001	Communicative English	3					None
6	LART 1001	Introduction to Civics and Ethics	3					None
7	HPEd1011	Health and Physical Education I	P/F					None
		Total	19					
Year I, Semester II								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	Math1102	Applied Mathematics II	4	6	3	1	0	Math1101
2	CSEg1102	Introduction to Emerging Technologies	3	5				None

3	CSEg1104	Fundamentals of Programming	3	5	2	0	3	SEng1101
4	LART 1002	Logic and Critical Thinking	3					None
5	MENg1032	Engineering Drawing	3					None
6	EnLa-1002	Basic Writing Skill	3					ENG1011
7	HPEd1022	Health and Physical Education II	P/F					HPEd1011
		Total	19					
		Year II, Semester I						
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	Math2101	Applied Mathematics III	4	6	3	1	0	Math1102
2	ECE2101	Electronics Circuit I	4	7	2	3	3	None
3	EPCE2101	Fundamentals of Electrical Engineering	4	7	2	3	3	None
4	CSEg2101	Data Structures & Algorithms	3	5	2	0	3	SEng1102
5	LART 1004	Geography of Ethiopia and the Horn	3	5	3	0	0	None
		Total	18					

Year II, Semester II								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	SEng2202	Object Oriented Programming	3	5	2	0	3	CSEg1101
2	SEng2102	Discrete Mathematics for Computer Science	3	5	2	0	3	Math2101
3	LART 2002	General Psychology and Life Skills	3	5	3	0	0	None
4	SEng2204	Computer Architecture & Organization	3	5	2	0	3	CSEg1101
5	SEng2206	Fundamentals of Software Engineering	3	5	2	0	3	None
6	SEng2208	Database Systems	4	7	3	0	3	None
Total			19					
Year III, Semester I								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	SEng3201	Software Requirements Engineering	3	5	3	0	0	SEng2206
2	SEng3203	Formal Methods in Software Engineering	3	5	3	0	0	SEng2102
3	SEng3205	Data Communication & Computer Networks	4	7	3	0	3	CSEg1101
4		Elective I	3	5				

5	SEng3207	Operating Systems	4	7	3	0	3	SEng2204
6	SEng3209	Advanced Programming	3	5	2	0	3	SEng2202
		Total	19					
Year III, Semester I - Elective I								
No	**Course Code**	**Courses Name**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisit**
1	SEng3301	Information Storage and Retrieval	3	5	2	0	3	SEng2208
2	SEng3303	Computer Graphics	3	5	2	0	3	CSEg1104
		Year III, Semester II						
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	SEng3202	Engineering Web Based System	3	5	2	0	3	CSEg1101
2	SEng3204	Software Architecture and Design	3	5	3	0	0	SEng3201
3	SEng3206	Mobile Application Design and Development	3	5	2	0	3	SEng2202
4		Elective I	3					
5		Elective II	3					
6	SEng3208	Programming under Unix/Linux Lab	2	4	0	0	3	SEng3207

Total			19					
Year III, Semester II - Elective I								
No	**Course Code**	**Courses Name**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisit**
1	ECEg3201	Digital Logic Design	4	7	2	1	3	ECEg2101
2	SEng3304	Implementation of Modern Operating System	4	7	2	1	3	SEng3207
Year III, Semester II - Elective II								
No	**Course Code**	**Courses Name**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre-requisit**
1	SEng3306	Compiler Design	3	5	3	0	0	None
2	SEng3308	Advanced Networking	3	5	2	0	3	SEng3205
Year III, Summar – Inernship I								
Year IV, Semester I								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	SEng4201	Software Testing and Quality Assurance	3	5	3	0	0	SEng2206, SEng3204
2	SEng4203	Software Evolution and Maintenance	3	5	3	0	0	SEng2206

3	LART 1003	History of Ethiopia and the Horn	3	5	2	0	3	None
4	SEng4205	Computer Systems Security	3	5	2	0	3	None
5		Elective I	3	5				
6		Elective II	3	5				
		Total	18					
Year IV, Semester I- Elective I								
1	ECEg3304	Microprocessor and Interfacing	3	5	2	0	3	ECEg3201
2	SEng4303	Introduction to Systems Engineering	3	5	3	0	0	None
Year IV, Semester I- Elective II								
1	SEng4307	Introduction to Computer Gaming and Animation	3	5	2	0	3	SEng3303
2	SEng4305	Distributed Software Systems	3	5	2	0	3	SEng3207
Year IV, Semester II								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	ECEg4102	Probability and Random Processes	3	5	3	0	0	None

2	SEng4204	Software Process and Project Management	3	5	3	0	0	SEng2206
3	SEng4206	Engineering Research and Development methodology	2	4	2	0	0	None
4	SEng4208	Introduction to Artificial Intelligence	3	5	2	0	3	None
5		Elective I	3	5				
6		Elective II	3	5				
		Total	17					
Year IV, Semester II - Elective I								
1	SEng4302	Embedded System and Robotic Control	3	5	2	0	3	CSEg1102
2	SEng4304	Human Computer Interaction	3	5	2	0	3	None
Year IV, Semester II - Elective II								
1	SEng4306	Blockchain and Cryptocurrency	3	5	2	0	3	SEng4205
2	SEng4308	Fundamental of Cloud and Edge Computing	3	5	2	0	3	SEng4305
Year IV, Summer – Internship II								
Year V, Semester I								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**

1	SEng5201	Senior Project I	3	5	0	0	9	Senior Standing
2	SEng5203	Ethics and Professionalism in Computing	2	4	2	0	0	None
3	SOSC5003	Entrepreneurship and Business Development	3	5	3	0	0	None
4	SOSC2002	Introduction to Economics	3	5	2	0	5	None
5		Elective I	3					
6		Elective II	3					
		Total	17					
Year V, Semester I- Elective I								
1	SEng5301	Introduction to Computer Vision and Image Processing	3	5	2	0	3	None
2	SEng5303	Introduction to Natural Language Processing	3	5	2	0	3	None
Year V, Semester I- Elective II								
1	SEng5305	Introduction to Machine Learning	3	5	2	0	3	None
2	SEng5307	Digital Forensics	3	5	3	0	0	SEng4205

Year V, Semester II								
No	**Course Code**	**Course Title**	**Cr.Hr.**	**ECTS**	**Lec**	**Tut**	**Lab**	**Pre- Request**
1	SEng5202	Senior Project II	3	7	0	0	12	SEng5201
2	SEng5204	Introduction Software Integration and Engineering	3	5	3	0	0	SEng2206
3		Elective I	3	5				
4		Elective II	3	5				
5		Free Elective	3	5				
Total			15					
Year V, Semester II- Elective I								
1	SEng5306	Component Based Software Development	3	5	2	0	3	SEng3204
2	SEng5308	Data and Application Security	3	5	2	0	3	SEng4205
3	SEng5302	Introduction to Big Data Analytics	3	5	2	0	3	None
Year V, Semester II- Elective II								
1	SEng5310	Introduction to Cybersecurity	3	5	2	0	3	SEng4205
2	SEng5304	Agile and Test Driven Development	3	5	3	0	0	SEng3204

7.5 Guidelines for Double Major and Minor

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 the several ways to prepare for the complexity of real-world problems whose solutions are drawn on multiple disciplines. Students with CGPA 3.5 or higher may be permitted to have a double major or minor consisting of programs majors from two programs.

7.5.1 Credit Requirements for Double Major and Minor

For the double major, a student has to successfully complete all courses specified by second major program for the double major (, and), while taking all courses required by the first major program.

Credit Requirements for Double Major

- 45 credit points for program in SoCEA, SoEEC and SoMCM
- 35 credit points for programs of SoANS

For the minor, a student has to successfully complete all courses specified by the second program for the minor, while taking all course required by the major program.

Credit Requirements for Double Minor

- 27 credit points for program in SoCEA, SoEEC and SoMCM
- 21 credit points for programs of SoANS

7.5.2 Deadline for Declaring a Double Major and Minor

The deadline to declare 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.

7.5.3 Eligibility Requirements

A student will eligible for dual major or minor degree should fulfill all the following eligibility requirements:

- Be registered as an undergraduate student in ASTU,

- Has 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 prerequisites courses set by the respective departments if any,
- Advisor recommendations,
- Apply on or before the deadline.

7.5.4 Maximum Credit Points Each Semester

The student who has been approved to pursue a double major or minor 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 the student ineligible for a degree.

7.5.5 Application Process

The Student applying for Dual Major or Minor should:

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

7.5.6 Duration of the Study

In order to receive a diploma for a double major or minor, 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 or continuing his/her studies until completing both majors, or minor. However, the total duration of study may not exceed 12 semesters for programs of SoCEA, SoEEC, SoMCM and 10 Semesters for SoANS.

7.5.7 List of Courses for Dual Major and Minor Requirements

A student from other programs who wants to have Dual Major Degree in Software Engineering must take Basic Requirement courses (6 credits) and Major Mandatory courses (65 credits) which is a total of 71 credit hours. The lists of courses are given in the table below:

Table 15: List of Courses for Dual Major Degree in Software Engineering

Major Mandatory Courses for Dual Major in SE				
No.	***Course Code***	***Course Title***	***Cr. Hr. (L-P-T)***	***Prerequisite***
1	CSEg2101	Data Structures & Algorithms	3(2-3-0)	CSEg1104
2	SEng2202	Object Oriented Programming	3(2-3-0)	CSEg1104
3	SEn3202	Engineering Web based System	3(2-3-0)	CSEg1101
4	SEng3207	Operating Systems	4(3-3-0)	SEng2204
5	SEng2206	Fundamentals of Software Engineering	3(3-0-0)	None
6	SEng2208	Database Systems	4(3-3-0)	None
7	SEng3205	Data Communication & Computer Networks	4(3-3-0)	CSEg1101
8	SEng2204	Computer Architecture & Organization	3(2-3-0)	CSEg1101
9	SEng4206	Engineering Research and Development Methodology	2(2-0-0)	None
10	SEng3201	Software Requirements Engineering	3(2-3-0)	SEng2206
11	SEng3203	Formal Methods in Software Engineering	3(3-0-0)	SEng2102
12	SEng4208	Introduction to Artificial Intelligence	3(2-3-0)	None
13	SEng3204	Software Architecture and Design	3(2-3-0)	SEng3201
14	SEng3206	Mobile Application Design and Development	3(2-3-0)	SEng2202
15	SEng4201	Software Testing and Quality Assurance	3(2-3-0)	Seng3204
16	SEng4203	Software Evolution and Maintenance	3(2-3-0)	SEng2206
17	SEng4204	Software Process and Project Management	3(3-0-0)	SEng2206
18	SEng4205	Computer systems Security	3(2-3-0)	None
19	SEng5204	Introduction to Software Integration and Engineering	3(2-3-0)	SEng2206
20	SEng2102	Discrete Mathematics for Computer Science	3(3-0-0)	Math1101

21	SEng4102	Probability and statics in computing	3(3-0-0)	Math1101
22	SEng3208	Programming under linux/unix Lab	2(0-3-0)	SEng3207
23	SEng5201	Senior Project I	3(0-3-0)	Senior SC
24	SEng5202	Senior Project II	3(0-3-0)	SEng5201
Total			**73**	

A student from other programs who wants to have Dual Minor Degree in Software Engineering must take the following selected Major mandatory courses which is a total of 30 credit hours.

Table 16: List of Courses for Dual Minor Degree in Software Engineering

Major minor courses				
No.	***Course Code***	***Course Title***	***Cr.Hr. (L-P-T)***	***Pre-requisite***
1	SEng2202	Object Oriented Programming	3(2-0-3)	CSEg1104
2	CSEg2101	Data Structures and Algorithms	3(2-0-3)	CSEg1104
3	SEng2208	Database Systems	4(3-0-3)	None
4	SEng3205	Data Communication and computer Networks	4(3-0-3)	SEng1101
5	SEng3207	Operating Systems	4(3-0-3)	SEng3207
6	SEng2206	Fundamentals of Software Engineering	3(3-0-0)	None
7	SEng3201	Software Requirements Engineering	3(2-3-0)	SEng2206
8	SEng3203	Formal Methods in Software Engineering	3(3-0-0)	SEng2102
9	SEn3202	Engineering Web based System	3(2-3-0)	CSEg1101
10	SEng3204	Software Architecture and Design	3(2-3-0)	SEng3201
11	SEng3201	Software Requirements Engineering	3(2-3-0)	SEng2206
12	SEng4201	Software Testing and Quality Assurance	3(2-3-0)	Seng3204
13	SEng3208	Programming under linux/unix Lab	2(0-3-0)	SEng3207
14	SEng4204	Software Process and Project Management	3(3-0-0)	SEng2206
15	SEng4205	Computer systems Security	3(2-3-0)	None
Total			**47**	

7.6 Course Syllabus

<table>
<tr><td colspan="7">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="3">School: Applied Natural Science</td><td colspan="3">Department: Applied Mathematics</td></tr>
<tr><td>2</td><td>Course Category</td><td colspan="5">Basic</td></tr>
<tr><td></td><td>Course Name</td><td colspan="5">Applied Mathematics I</td></tr>
<tr><td></td><td>Course Code:</td><td colspan="5">Math1101</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">This course covers vectors , matrices & determinants, limit and continuity, derivatives & their applications, integrals, integration techniques and their applications</td></tr>
<tr><td>4</td><td>Academic Staff:</td><td colspan="5"></td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>I</td><td>Year:</td><td>1</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">4</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">None</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>CLO-1</td><td colspan="5">Apply the basic principles of vectors to solve the problems that needs concepts of vector operations</td></tr>
</table>

	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 program Learning Outcomes, Teaching Methods and Assessment	

Course Learnin	Program Learning Outcomes (PO)																					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9				Teaching Methods				Assessment					
													L	T		C D	Test I	Test II	Assignment I	Quiz	Assignment II	Final

	gOutcomes (CLO)																						
	CLO-1	√												√	√	√	√	√		√			√
	CLO-2		√											√	√	√	√	√		√			√
	CLO-3	√												√	√	√	√				√		√
	CL		√											√	√	√	√		√			√	√

	O-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	Mathematical skills that used to solve different practical engineering problems
	2	
	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:Vector	CLO-1, CLO-6	10	5			1	8	24
	1.1 Definition of vectors			1				1	
	1.2 Vector operations		1	1				1	1
	1.3 Norm of a vector		1					1	1
	1.4 Scalar product		1					1	1
	1.5 Projection of Vectors		2					1	1
	1.6 Cross product		2	1				2	2
	1.7 Lines and planes in space		3	1				2	2
	Chapter 2: Matrix and determinant	CLO-2, CLO-6	13	8			1	12	34
	2.1 Definition of matrix and types of matrix		1	1				1	
	2.2 Matrices Operations		1					1	

	2.3 Transpose of matrix		1					1	
	2.4 Elementary row Operations		1					1	
	2.5 Echelon form and rank of a matrix		2	2				1	
	2.6 Inverse of a matrix and its Properties		2	1				2	
	2.7 Determinant of a matrix and its properties		2	1				2	
	2.8 Solving systems of linear Equations 2.8.1 Cramer's rule 2.8.2 Gaussian's method 2.8.3 Inverse matrix method		3	1				2	
	Chapter 3: Limit and Continuity	CLO-3, CLO-6	7	4			1	7	19
	3.1 Basic Concepts of limit		2					1	
	3.2 Limit Theorems		1	1				1	

	3.3 Asymptotes		1					1	
	3.4 Formal definition of Limits		1	2				2	
	3.5 Continuity		1					1	
	3.6 Intermediate value Theorem		1	1				1	
	Chapter 4: Derivative and Its Applications	CLO-4, CLO-6	14	10			1	9	34
	4.1 Definition of derivatives and rules of differentiation		3	2				2	
	4.2 Higher order Derivatives			2				2	
	4.3 Implicit Differentiation		3	2				1	
	4.4 Derivatives of inverse Functions 4.4.1 Inverse trigonometric functions and their derivatives 4.4.2 Inverse hyperbolic functions and		4	3	1	1		2	

	their derivatives								
	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		6	3			1	2	
	Chapter 5: Integration and Its Applications	CLO-5, CLO-6	12	9			1	15	37
	5.1 Anti-Derivatives; Indefinite Integrals		1					1	
	5.2 Techniques of Integration		4	2				2	
	5.3 Definite Integrals; Fundamental Theorem of Calculus		2	2				2	

	5.4 Improper Integrals		1	2				1	
	5.5. Application of Integration		4	3			1	4	
		Total	56	36			5	51	148

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	10	√		1
2	Tests (2)	20	√		2
3	Assignments(2)	20		√	6
4	Total				9

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.
		3	Choose an item.
		4	Choose an item.
		5	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

<table>
<tr><td>1</td><td colspan="2">School: Applied Natural Science</td><td colspan="4">Department: Applied Mathematics.</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="5">Basic</td></tr>
<tr><td>Course Name</td><td colspan="5">Applied Mathematics II</td></tr>
<tr><td>Course Code:</td><td colspan="5">Math1102</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">This course covers sequences, series, power series, Fourier series differential and integrals calculus of functions of several variables and their applications problems. This course covers integer programming, deterministic dynamic programming, inventory models, forecasting models, decision making, Queuing Theory, and Simulation Models.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5">Goshu Geleta,Segni Adugna, Mrs.SidiseGeyssa, Mr. MoybonWolde, Mr.Fikremariam Shitiye, Mr. Abebe Girma, Mr. Aman Tunshura, Mr. Zena Sahilemariam, Mr. Solomon Balcha, Mr. Lemessa Berewak,Genene W. Musa. …</td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>II</td><td>Year:</td><td>1</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">4</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">Applied Mathematics I (Math 1101)</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>
</table>

	CLO-1	Understand basics and types of sequence and series and their properties
	CLO-2	Acquire the knowledge on power series and application of Taylor's series.
	CLO-3	Know about Fourier series and half-range expansion.
	CLO-4	Solve different limit problems partial derivatives
	CLO-5	Formulate and solve different optimization problems.
	CLO-6	Evaluate multiple integral problems and understand its applications

9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																				
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																			
		PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9				Teaching Methods				Assessment			
														L	T	P	O	Test	Assignment	Mid-exam	Final Exam
	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	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	10	6			2	9	27
	1.1. Definition of Infinite sequence		1	1					
	1.2. Convergence and divergence properties of series		2						
	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		2	1					
	1.6. Generalized convergence Test		2	2					
	Chapter 2: Power Series	CLO-5	12	6			2	9	29
	2.1.Definition of power series at any point		2	3					
	2.2.Convergence and divergence, radius and interval of convergence of power series		2						

	2.3.Algebraic operation on convergent power series		2						
	2.4.Differentiation and integration of power series		2	3					
	2.5.Taylor series, Taylor polynomial and application		2						
	Chapter 3: Fourier Series	CLO-4	8	6			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		2	1					
	3.5. Fourier integral		2	1					
	Chapter 4: Differential Calculus of Functions of Several Variables	CLO-4	14	10			2	9	35
	4.1 Notations, Examples, level curves and graphs		1						
	4.2 Limit and continuity		1	1					
	4.3 Partial Derivatives, tangent lines, higher		2	2					

	order partial derivatives								
	4.4 Directional derivatives and gradients		2	1					
	4.5 Total differential and tangent planes		1						
	4.6 Applications: Tangent plane approximation of values of functions		1						
	4.7 The chain rule, implicit differentiation		2	1					
	4.8 Relative extrema of functions of two variables		2	1					
	4.9 Largest and smallest values of a function on a given set		1	2					
	4.10 Extreme values under constraint condition: Lagrange's method		2	2					
	Chapter 5: Multiple Integrals	CLO-1	12	6			3	9	30
	5.1 Double integrals and their evaluations by iterated intzzzegrals		2	1					
	5.2 Double integrals in polar coordinates		2						
	5.3 Applications: Area, center of mass of		2	1					

	plane region								
	5.4 Triple integrals in cylindrical and spherical coordinates	CLO-3	2	2					
	5.5 Application: Volume, Center of mass of solid region		2	2					
	5.6 Change of variables in multiple integrals		2						
	Total		56	34			11	45	146

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

	4	Assessment-2	10%		√	3
	5	Mid-Exam	25%	√		3
	Total					11
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	√		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.

<table>
<tr><td colspan="7">AdamaScience and Technology University</td></tr>
<tr><td>1</td><td colspan="3">School: Applied Natural Science</td><td colspan="3">Department: Applied Mathematics</td></tr>
<tr><td>2</td><td>Course Category</td><td colspan="5">Basic</td></tr>
<tr><td></td><td>Course Name</td><td colspan="5">Applied Mathematics –III</td></tr>
<tr><td></td><td>Course Code:</td><td colspan="5">Math2101</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">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.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5">Mr.LemessaBerewak, Solomon Balcha, ZenaSahilemariam, AbebeGirma, FikremariamShitye, SidiseGeysa, AmanTunshura</td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>I</td><td>Year:</td><td>2</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">4</td></tr>
<tr><td>7</td><td>Prerequisite/ Co-requisite: (if any)</td><td colspan="5">Applied Mathematics-II</td></tr>
</table>

8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO-1	Define and classify Differential Equation, solve first order ordinary differential equation , system of first order ordinary differential equation and also problems governed by first order ordinary differential equation
	CLO-2	Define and classify second order Ordinary Differential equation, solve second order ordinary differential equation and problems governed by second order ordinary differential equation
	CLO-3	Define Laplace transformation, find Laplacetrans form and Inverse Laplace transform of functions and then apply it to solve Differential equation and an Integro-differential equation.
	CLO-4	Define scalar field, vector field and curve, define and find arc length, tangent, gradient of a scalar field and curl of a vector field, analyze the theory of line integral and surface integral, state and apply Green's theorem, Gauss divergence theorem and stock's theorem in application
	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 program Learning Outcomes, Teaching Methods and Assessment:=																					
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
		PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9				Teaching Methods				Assessment				
														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 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	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	8	8			3	7	26	
	1.1 Preliminary concepts		1	1						
	1.2 Separable Equations		1	1				1		
	1.3 Homogeneous Differential Equations		1	1				1		
	1.4 Exact Differential Equations		1	1			1	1		
	1.5 Non Exact differential equation and Integrating Factors		2	2			1	2		
	1.6 Linear differential Equation (with application)		2	2			1	2		
	Chapter 2: Ordinary Linear Differential Equation of the second order	CLO-2	1 2	11			2	8	33	
	2.1 Homogeneous Linear Differential Equations of the second order		2	1				1		
	2.2 Homogeneous second order Differential Equations with constant coefficients		2	2				1		

	2.3 General Solutions, Basis		2	2				1		
	2.4 Real Roots, Complex Roots and Double Roots of the characteristic Equations		2	2			1	2		
	2.5Method for solving non-homogeneous Linear Differential Equations		2	2				1		
	2.6 System of Differential Equation		2	2			1	2		
	Chapter 3:Laplace Transforms	CLO-3	6	6			2	8	22	
	3.1 Laplace Transformations		2	2				2		
	3.2 Differential and Integration of Laplace Transformations		2	2			1	3		
	3.3 Convolution and Integral Equations		2	2			1	3		
	Chapter 4: Vector Calculus	CLO-4	1 4	12			3	8	37	
	4.1 Scalar Field and Vector Fields		1	1						
	4.2Vector calculus		2	1						
	4.3 Curves, Arc Length and Tangent		2	1				1		

	4.4 Gradient of a scalar Field, Divergence and Curl of a Vector Field		2	2				2		
	4.5 Line Integrals, Line Integral Independent of Path and Greens Theorems		3	3			1	2		
	4.6 Surface Integrals, Gauss Divergence Theorem and Its Application		2	3			1	2		
	4.7Stock's Theorems and Its Application		2	1			1	1		
	Chapter 5:Complex Analysis	CLO-5	8	5			2	6	21	
	5.1Complex Analytic Functions		3	1				1		
	5.2 Complex Integrals		2	2				2		
	5.3Integration by method of residue		3	2			1	3		
	Total		48	42			12	37	139	

	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Tests(2)	20%	√		2
	3	Assignments(2)	20%		√	15

	4	Quizzes(2)	10%	√		1
					Total	18
	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	School: ***Applied Science***			***Department: Physics***		
2	Course Category	***Core Module***				
	Course Name	***General Physics***				
	Course Code:	***Phys1101***				
3	Synopsis:	At the end of this course students are expected to be acquainted with basic concepts in different branches of physics, identify the connection between them and explain the common phenomena. They will also develop skills of solving problems.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	1	

6	Credit Hour:	4
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	Discuss basic physics by refreshing and summarizing the previous preparatory physics concepts before tackling the advanced physics courses.
	CLO2	Explain the kinematics and dynamics of particles in one and two dimensions and to explain the basic concepts of charges, fields and potentials.
	CLO3	Demonstrate the use and the working system of cells (batteries), resistors, generators, motors and transformers.
	CLO4	Explain the first law of thermodynamics for a closed system and apply it to solve problems.
	CLO5	Discuss 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 program Learning Outcomes, Teaching Methods and Assessment:												
	Course Learnin	Program Learning Outcomes (PO)											
		P	P	P	P	PO5	P	P	P	PO9			Assessment

	g Outcomes (CLO)	O1	O2	O3	O4		O6	O7	O8			Teaching Methods				Test	Quiz	Assignment	Project	Lab-report
												L	T	P	C					
	CLO1	√	-	-	-	-	-	-	-	-	-	√	√	-	-	√	√	√	-	-
	CLO2	-	-	√	-	-	-	-	-	-	-	√	√	-	-	√	√	√	-	-
	CLO3	-	√	-	-	-	-	-	-	-	-	√	√	-	-	√	√	√	-	-
	CLO4	-	-	√	-	-	-	-	-	-	-	√	√	-	-	√	√	√	-	-
	CLO5	-	-	√	-	-	-	-	-	-	-	√	√	-	-	√	√	√	-	-

	CLO6	-	-	-	-	-	-	-	-	-	√	√	√	-	-	√	√	√	-	-
	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. 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)

<table>
<tr><td rowspan="3">Course Content Outline</td><td rowspan="3">CLO</td><td colspan="6">Teaching and Learning Activities</td><td>Total (SLT)</td></tr>
<tr><td colspan="4">Guided learning (F2F)</td><td>Guided Learning (NF2F)</td><td>Independent Learning (NF2F)</td><td></td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>O</td><td></td><td></td><td></td></tr>
</table>

	Chapter 1: Preliminaries		**6**	**4**	**-**	**-**	**2**	**3**	**15**
	1.1 Physical Quantities and Units of Measurement	CLO1	6	2	-	-	1	1	15
	1.2 Uncertainty in measurement and significant Digits	CLO1			-	-	-	1	
	1.3 Vectors: composition and resolution	CLO1		2	-	-	1	1	
	1.4 Unit Vectors	CLO1			-	-	-	-	
	Chapter 2: Kinematics and Dynamics of Particle		**16**	**8**	**-**	**-**	**7**	**2**	**33**
	2.1 Displacement, Velocity and Acceleration in 1D and 2D	CLO2	2	2	-	-	2	-	7
	2.2 Motion with Constant Acceleration	CLO2			-	-	1	-	
	2.3 Free Fall Motion & Projectile motion	CLO2	3	1	-	-	2	-	6
	2.4 Particle Dynamics	CLO2	3	1	-	-	2	-	9
	2.5 Planetary Motion	CLO2	2		-	-	1	-	
	2.6 Work, Energy and Linear Momentum	CLO2	3	1	-	-	1	-	5

	Chapter 3: Fluids Mechanics		**8**	**4**	**-**	**-**	**4**	3	**19**
	3.1 Properties of Bulk Matter /Stress, Strain	CLO3	4	2	-	-	1	1	10
	3.2 Density and Pressure in Static Fluids	CLO3			-	-	1	1	
	3.3 Buoyant Forces, Archimedes' principle	CLO3	4	2	-	-	1	1	9
	3.4 Moving Fluids and Bernoulli's Equation	CLO3			-	-	1	-	
	Chapter 4: Heat and Thermodynamics		**8**	**4**	**-**	**-**	**7**	4	**23**
	4.1 The Concept of Temperature: Zeroth Law of Thermodynamics	CLO4	4	2	-	-	1	-	13
	4.2 The Concept Heat and Work	CLO4			-	-	2	1	
	4.3 Specific Heat and Latent Heat	CLO4			-	-	2	1	
	4.4 Heat Transfer Mechanism	CLO4	4	2	-	-	1	-	10
	4.5 Thermal Expansion	CLO4			-	-	1	-	
	4.6 Energy Conservation: First Law of Thermodynamics	CLO4			-	-	2	-	
	Chapter 5: Oscillations, Waves and		**8**	**4**	**-**	**-**	**6**	5	**23**

	Optics								
	5.1 Simple Harmonic Motion	CLO5	4	2	-	-	1	1	12
	5.2 The Simple Pendulum	CLO5			-	-	1	1	
	5.3 Wave and Its Characteristics	CLO5			-	-	2	-	
	5.4 Resonance, Doppler Effect	CLO5	4	2	-	-	1	1	11
	5.5 Image formation by thin lenses and mirrors	CLO5					2	1	
	Chapter 6: Electromagnetism and Electronics		**7**	**4**	**-**	**-**	**7**	**4**	**22**
	6.1 Coulomb's Law, Electric Fields & Electric Potential	CLO2	2	2	-	-	1	1	11
	6.2 Current, Resistance and Ohm's Law	CLO2			-	-	1	1	
	6.3 Electrical Power, Equivalent Resistance and Kirchhoff's Law	CLO2			-	-	2	1	
	6.4 Magnetic Field, Magnetic Flux & Electromagnetic Induction	CLO2	3	2	-	-	1	1	11
	6.5 Insulators, Conductors & Semiconductors	CLO2			-	-	1	1	

	6.6 Diodes Characteristics Curve &Transistors	CLO2			-	-	2	-	
	Chapter 7: Cross Cutting Applications of Physics		**6**	**4**	**-**	**-**	**6**	**4**	**20**
	7.1 Application in Agriculture	CLO6	3	2	-	-	1	-	10
	7.2 Physics and Industries	CLO6			-	-	1	1	
	7.3 Physics in Health Sciences and Medical Imaging	CLO6			-	-		1	
	7.4 Physics and Archeology	CLO6	3	2	-	-	1	1	10
	7.5 Application in Earth and Space Sciences	CLO6			-	-	1	1	
	7.6 Application in Power Generation	CLO6			-	-	1	-	
	Total		**58**	**31**	**-**	**-**	**28**	**34**	**148**
	Assessment								
	Continuous Assessment	Percentage Total-50(%)		F2F		NF2F		SLT	

	1	Quiz 1	5	√	-	30 minutes
	2	Quiz 2	5	√	-	30 minutes
	3	Assignment 1	5	-	√	3
	4	Assignment 2	5	-	√	4
	5	Mid Test	30	√	-	1hr
	Total					9 hrs.
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		50	√	-	3 hrs.
	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.					
1	Special requirements and resources to deliver the course		1	White Board and Marker		

2	(e.g. software, computer lab, simulation room …etc.)	2	LCD Projector and softwares
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: ***SoEEC***	Department: ***Computer Science and Engineering***
2	Course Category	***Basic Mandatory***
	Course Name	***General Chemistry***
	Course Code:	***Chem1101***
3	Synopsis:	General chemistry is the science of the properties of atoms and the laws governing their combination, composition, and structure of substances, the transformations they undergo, and the energy that is released or absorbed during chemical or physical process. The topics covered in this course includes: Introduction to the study of modern chemistry, acids and bases, the periodic table, chemical bond and molecular structure, rates of physical and chemical processes, materials, kinetic molecular description of the state of matter and equilibrium

		in chemical reaction.
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)	None
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	To become familiar with the scope, methodology, and application of modern chemistry and to learn to appreciate its ability to explain the physical world
	CLO2	Know the solution types, the dissolving process and the relationship between solubility & temperature.
	CLO3	Identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships
	CLO4	Identify the characteristics of liquids and solids, including phase diagrams and different materials like polymers, inorganic and organic materials.
	CLO5	Predict atomic structure, chemical bonding or molecular geometry based on accepted models.
	CLO6	Describe the principles of kinetics and thermodynamics as applied to rates and equilibrium positions of chemical reactions.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Out	Program Learning Outcomes (PO)								
	PO	PO	PO	PO	PO	PO	PO	Teaching	Assessment

									Methods				Test	Quiz	A ss	Project	Mid	Final ex
									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 (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						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			

	Chapter 1: Introduction to the study of modern chemistry 1.1 The atom in modern chemistry	CLO1	2					4	6
	1.2 Chemical formulas, chemical equations, and reactions yields	CLO1	2				2	4	8
	Chapter 2: Chemical Bonding and Molecular Structure 2.1 Chemical Bonding: The classical description	CLO5	2					4	6
	2.2 Introduction to Quantum Mechanics	CLO5	2					4	6
	2.3 Quantum Mechanics and Atomic Structure	CLO5	2					4	6
	2.4 Quantum Mechanics and Molecular Structure	CLO5	2	1				3	6
	2.5 Bonding in organic Molecules	CLO5	2					4	6
	Chapter 3:Kinetic Molecular Description of the State of Matter 3.1 The Gaseous State	CLO6	2					4	6
	3.2 Solid, Liquids, and, Phase transitions	CLO4	2					4	6
	3.3Solutions	CLO2		1				3	4
	Chapter 4:Equilibrium in Chemical Reactions 4.1 Thermodynamic Processes and	CLO6	2	1			2	3	8

	Thermochemistry								
	4.2 Spontaneous Processes and Thermodynamic Equilibrium	CLO6	2					3	5
	4.3 Chemical Equilibrium	CLO6	2	1				4	7
	4.4 Acid-Base Equilibria	CLO3	1	1				3	5
	4.5 Solubility and Precipitation Equilibria	CLO2	1					2	3
	4.6 Electrochemistry	CLO1	2					3	5
	Chapter 5 Rates of Physical and Chemical Processes 5.1 Chemical Kinetics	CLO2	2	1				3	6
	6 Materials 6.1 Structures and Bonding in Solids	CLO4	2					4	6
	6.2 Inorganic Materials	CLO4	2					3	5
	6.3 Polymeric Materials	CLO4	1					3	4
								Total	110

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

	3	Quiz	5	1		1
	4	Mid exam	30	2		2
					Total	7
	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.					
1	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	Choose an item.			
		5	Choose an item.			
2	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	M. S. Silberberg; Principles of General Chemistry, 2007.			
		4	P. W. Atkins and J. A. Bern, General Chemistry, 2nd Ed, 1992.			
		5	S.S. Zumdahol and S.A. Zumdahal, Chemistry, 7th Ed, 2007.			
		6	J.W. Hill and R.H. Petrucci; General Chemistry; An integrated Approach, 2nd Ed, 1999.			

<table>
<tr><td colspan="7">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="2">School: Electrical Engineering and Computing</td><td colspan="4">Department: Computer Science and Engineering</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="5">Basic</td></tr>
<tr><td>Course Name</td><td colspan="5">Introduction to Emerging Technologies</td></tr>
<tr><td>Course Code:</td><td colspan="5">CSEg1102</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">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.</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>I</td><td>Year:</td><td>I</td><td></td></tr>
<tr><td>6</td><td>Credit Hour:</td><td colspan="5">3</td></tr>
<tr><td>7</td><td>Prerequisite/</td><td colspan="5">None</td></tr>
</table>

	Co-requisite: (if any)	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	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.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√								√			√	√		√		

	CLO2	√									√			√		√		√	
	CLO3							√			√			√	√		√		
	CLO4	√									√			√	√		√		
	Indicate the relevance 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	Teaching and Learning Activities			Total (SLT)
			Guided learning (F2F)	Guided Learning (NF2F)	Independent Learning(NF2F)	

				L	T	P	O			
		Chapter 1: Introduction to Emerging Technologies	CLO1							9hr
		Evolution of technologies ○ Introduction to Industrial revolution ○ Historical background (IR 1.0, IR 2.0, IR 3.0) ○ Fourth industrial revolution (IR 4.0)								
		Role of data for Emerging								

		technologies								
		Enabling devices and networks for emerging technologies (programmable devices)								
		Human to Machine Interaction								
		Future trends in emerging technologies								
		Chapter 2 : Introduction to Data Science	CLO2							9hr

		Overview for Data Science ○ Definition of data and information ○ Data types and representation								
		Data Value Chain ○ Data Acquisition ○ Data Analysis ○ Data Curating ○ Data Storage ○ Data Usage								
		Basic concepts of Big data								

		Chapter 3: Artificial Intelligence(AI)	CLO2							10hr
		Introduction to AI ○ What is AI ○ History of AI ○ Levels of AI ○ Types of AI								
		Applications of AI ○ Agriculture ○ Health ○ Business (Emerging market) ○ Education								
		AI tools and platforms (eg: scratch/object								

		tracking)								
		Sample application with hands on activity (simulation based)								
		Chapter 4: Internet of Things(IoT)	CLO2							9hr
		Overview of IOT ○ What is IOT? ○ History of IOT ○ Advantages of IOT ○ Challenges of IOT								
		4.1 How IOT works ○ Architecture of IOT ○ Devices and network								

		4.2 Applications of IOT ○ Smart home ○ Smart grid ○ Smart city ○ Wearable devices ○ Smart farming								
		4.3 IOT tools and platforms (eg: KAA IoT /Device Hive/Zetta/Things Board…)								
		4.4 Sample application with hands on activity (eg IOT based smart farming)								
		Chapter 5: Augmented Reality	CLO2							10hr

		(AR)								
		5.1 Introduction to AR								
		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	CLO3							6hr
		6.1 Technology and ethics								
		6.2 Digital privacy								
		6.3 Accountability and trust 6.4 Treats and challenges								
		Chapter 7 Other emerging technologies	CLO4							15hr
		7.1 Nanotechnolog y								
		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						68hr

		Assessment				
		Continuous Assessment	Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)	2hr	6hr	8hr
	2	Assignments	Assignment II (10%)	2hr	6hr	8hr
	4	Test	(10%)	1hr	6hr	7hr
	5	Quiz	5%	1hr	3hr	4hr
	6	Others	Mid Exam (25%)	2hr	8hr	10hr
					Total	37hr
		Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
		Final Exam	40%	3hr	12hr	15hr
					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	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	● 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

Adama Science and Technology University							
1	School: ***SoEEC***			***School of Electrical Engineering and Computing***			
2	Course Category	***Basic***					
	Course Name	***Introduction to Computing***					
	Course Code:	***CSEg1101***					
3	SLT:	120hrs					
4	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 and Year offered:	Semester:	I	Year:	I (Pre-Engineering)		
6	Credit Hour:	3					
7	Prerequisite/ Co-	No					

	requisite: (if any)	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO1	Develop 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	Use basic searching and sorting algorithms and data structure to solve a given problem.
	CLO4	Discuss the basic concepts of object-oriented programming.
	CLO5	Apply the programming practices of good style, documentation and testing.

9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																					
	Course Learning Outcomes (CL	Program Learning Outcomes (PO)																				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods				Assessment				
														L	T	P	C	Test	Quiz	[illegible]	Project	Lab-re

	O)																					port
	CLO1	√												√		√	√		√			
	CLO2	√												√		√						
	CLO3	√												√		√		√		√		√
	CLO4		√											√		√	√		√	√		
	CLO5					√								√		√		√		√	√	√
	L = Lecture, T = Tutorial, P = Practical, O = Others(Group Discussion(GP), Question and Answering(QA))																					

10	Distribution of Student Learning Time (SLT)			
	Course Content Outline	CLO	Teaching and Learning Activities	Total (SL

									T)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Introduction to computational thinking and programming ● Introduction ● What is computation? ● Computational thinking ● About python Case study: 2D robot control	CLO1							3hrs
	Chapter 2 Control structure • Conditionals • Iterations • Case study: 2D robot control	CLO2							5 hrs
	Chapter 3: Working with objects, operators and expressions • Objects: values and types • Variables	CLO4							5 hrs

	• Operators and operands • Expressions Case study: photo processing								
	Chapter 4: Functions • Basics of functions • Built-in functions and modules • User-defined functions • Case study: adding beeper to robot • Case study: triangular inequality Case study: drawing different graphs	CLO2							5 hrs
	Chapter 5: Scope of variables and modules and, higher order functions ● Scope of a variable ● More on module ● Working with shapes ● Working with higher order functions ● Mutability of objects ● Case study: sun animation	CLO2							4hrs
	Chapter 6: Data structures	CLO3							4hrs

	Working with tuples, strings , lists and dictionaries								
	Chapter 7: Parameters, files, formatting and more on strings • More on dictionaries • Named parameters • Files • String formatting • String methods Case study: photo processing	CLO2							4hrs
	Week 8: mid-term exam								

	Chapter 8: Sorting and Recursion
	• Sorting in python
	  ○ Selection sort
	  ○ Bubble sort
	• Recursion
	• Case study: comparisons functions, palindromes, vegetable and fruit store
		CLO3							4hrs

	Chapter 9: Searching and merge sort • Divide and conquer • Binary search • Merge sort Case study: data analysis and data plotting	CLO3							5hrs
	Chapter 10 : Problem solving techniques ● Maximum subsequence problem ● Brute force enumeration ● Incremental computation ● Divide and conquer Case study: programming with global coordinate data, temperature data and HTML files	CLO1							4hrs
	Chapter 11: Dynamic programming • What is dynamic programming? • Fibonacci numbers revisited • Case study: listing decision nodes and function calls	CLO1							4hrs
	Chapter 12 : Object-oriented programming	CLO4							5hrs

	concepts • Object-oriented programming • Encapsulation • Inheritance • Case study: chicken family animation								
	Chapter 13: Classes and objects • Classes and Objects • Attributes • Methods Case study: game	CLO4							6hrs
	Chapter 14 : GUI • Playing blackjack • Table layouts Case study: dealing with cards	CLO5							4 hrs
	Week 16: Final exam								

	Assessment				
	Continuous Assessment	Percentage Total-60(%)	F2F	NF2F	SLT

	1	Assignments	Assignment 1 (5%)	1hr	3hr	4hrs
	2	Assignments	Assignment 2 (10%)	2hr	6hr	8hrs
	3	Project	15%	2hrs	15hrs	17hrs
	4	Others	Mid Exam (25%)	2hr	8hr	10hrs
	5	Quizzes	5%	1hr	3hr	4hr
					Total	43hrs
	Final Exam		40%	3hr	12hr	15hrs
					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.					
	Text book and references:	1	Jeffrey Elkner, Allen B.Downey, Chris Meyers. How to Think Like a Computer Scientist, Learning with Python. http://openbookproject.net/thinkcs/ python/english2e/index.html			
		2	Online tutorials: e.g., http://tutorialspoint.com/python			

2	Course Category	***General Mandatory***				
	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.				
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:					
	CLO1	Describe basic psychological concepts				
	CLO2	Compare and contrast the major theoretical perspectives in psychology				
	CLO3	Examine major concepts in psychology: personality; sensation and perception; learning, memory and forgetting.				
	CLO4	Summarize motivational and emotional processes.				
	CLO5	Demonstrate basic life skills (intrapersonal, interpersonal, social and academic skills) in everyday life.				
	CLO6	Apply knowledge of psychology in their life.				
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:					

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
										L	T	P	O	Test	Quiz	Assignment	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 (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)			
			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:ESSENCE OF PSYCHOLOGY 1.1Definition of Psychology and Related Concept	CLO1	2hrs			2hrs		2hrs	6hrs
	1.2Goals of Psychology		1hr					1hr	2hrs
	1.3Historical Background and Major Perspectives in Psychology		1hr	1hr				1hr	3hrs
	Chapter 2:SENSATION AND PERCEPTION 2.1The meanings of sensation and perception	CLO3	1hr			2hrs		1hr	4hrs
	1.2.The sensory lows: Sensory threshold and sensory adaptation		1hr				6hrs	1hr	8hrs
	1.3.Perception		3hrs	1hr				3hrs	7hrs
	Chapter 3:LEARNING AND THEORIES OF LEARNING 3.1Definition, Characteristics and Principles of Learning	CLO2	1hr			2hrs		1hr	4hrs
	3.2Factors Influencing Learning		1hr					1hr	2hrs
	3.3Theories of Learning and their		6hrs	2hrs			6hrs	6hrs	20hrs

	Applications								
	Chapter 4:MEMORY AND FORGETTING 4.1 Memory	CLO3	2hrs			2hrs		2hrs	6hrs
	4.2 Forgetting		1hr					1hr	2hrs
	4.3 Improving Memory		2hrs	1hr				2hrs	5hrs
	Chapter 5:MOTIVATION AND EMOTIONS 5.1 Motivation	CLO4	1hr			2hrs		1hr	4hrs
	5.2 Definition and types of motivation		1hr					1hrs	2hrs
	5.3 Approaches to motivation (theories of motivation)		3hrs	2hrs				3hrs	8hrs
	5.4 Conflict of motives and frustration 5.5 Emotions		2hr					2hrs	2hrs
	5.6 Theories of emotion		3hrs	2hrs			6hrs	3hrs	14hrs
	Chapter 6: PERSONALITY 6.1. Meaning of Personality	CLO3	1hr					1hr	2hrs
	6.2. Theories of Personality		3hrs	1hr				3hrs	7hrs
	Chapter 7: LIFE SKILLS 7.1 Basic Concepts of Life-skills	CLO5	3hrs			2hrs		3hrs	8hrs
	7.2 Intra-Personal and Interpersonal Skills		3hrs	1hr				3hrs	7hrs
	7.3 Academic Skills		3hrs	1hr			8hrs	3hrs	15hrs

	7.4 Social Skills		3hr	1hr				3hrs	7hrs
	Total		48hrs	13		14hrs	26hrs	48hrs	149hrs

	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%	√		1:30hrs
	5					
					Total	13:30hrs

	Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam	50%	√		2hrs
				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	Well-furnished classroom
		2	Laptop
		3	LCD
		4	Whiteboard
		5	Whiteboard marker
13	Text book and reference:	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

	(note: ensure the latest edition /publication)		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.

1	Adama Science and Technology University	
	School: ***Humanities and Social Science***	Department:***Language Unit***
2	Course Category:	***General Mandatory***
	Course Name:	***Communicative English Skills***
	Course Code:	***ENLA 1001***
3	Synopsis/ Course Description	Communicative English Skills is a course where students learn what they need to know for a career in engineering. The course gives students the language, information, and skills they need to study engineering. It also provides students the language appropriate for studying engineering context in real work situations as it comprises unique sections such as: **'it's my job'** wherein real people talk about their work in engineering, **'listening'** whereby students are exposed to situations related to science dialogues, technical explanations, and interviews, **'reading'** whereby students meet a variety of science and technology based texts, and the **'writing section'**

		whichis 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:				
	CLO1	Make presentations on a wide variety of technological fields and situations (PLO10).			
	CLO2	Listen to dialogues, technical explanations and interviews and identify the central message (PLO10)..			
	CLO3	Comprehend varieties of texts related to engineering. (PLO10).			
	CLO4	Recognizevarious aspects of words. (meaning, collocations, pronunciation, etc) (PLO10).			
	CLO5	Compose short texts, reports, etc. (PLO10).			
	CLO6	Apply grammatical items for communications in engineering context. (PLO10).			
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:				

Course Learning Outcomes (CLO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assi	Mid	final
CLO1					✓						✓					✓	✓

	CLO2					✓						✓			✓		✓	✓
	CLO3					✓						✓		✓			✓	✓
	CLO4					✓							✓	✓				✓
	CLO5					✓				✓		✓			✓	✓		✓
	CLO6					✓				✓		✓		✓				✓
	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	Study skills
	2	Listening skills
	3	Presentation skills
	4	Communication 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: Technology and Society 1.1 Listening: Technology and works	1,2,3,4 &6	2hrs		4hrs			10hrs	16 hrs
1.2 Language Spot: Comparison with adjectives and adverbs								
1.3 Reading: Branches of								

	technology 1.4 Speaking: satellite launch system 1.5 Vocabulary: Recording new words and word stress								
	Chapter 2: Studying Technology 2.1Reading :Civil Engineering 2.2Listening: The course 2.3 Language Spot: Present simple V Present continuous 2.4 Pronunciation: Strong and weak forms of auxiliary verbs	1,2,3,4,&6	1hr		2hrs	2hrs		8hr	13hrs
	Chapter 3: Design 3.1 Listening :The design process 3.2Language Spot: Question types 3.3Speaking: Using Non- specialist language 3.4 Listening: Working with design and problem solving	1,2,3&6	1hr		3hrs			11hrs	15 hrs
	Chapter 4: Appropriate Technology 4.1Reading: The inventor 4.2Language Spot: Time clauses 4.3Pronunciation: Number and quantities 4.4 Vocabulary: Describing motion	1,3,4,&6	1hr		3hrs	2hrs		10hrs	16hrs
	Chapter 5: Manufacturing 5.1Listening: Manufacturing process 5.2Language Spot: Present passive 5.3Writing: Short sequence	1,2,3,4,5&6	2hrs		3hrs			8hrs	12 hrs

	5.4 Vocabulary: Compound nouns								
	Chapter 6: Transport	1,2,3,4,5&6	1hr		3hrs			6hrs	10 hrs
	6.1 Reading: The car of the future								
	6.2Language Spot:Prediction will, may, might								
	6.3 Speaking: Making and acknowledging apologies								
	6.4Vocabulary:Recording new expressions								
	Chapter 7: Information Technology:	1,2,3,4,&6	1hr		3hrs			6hrs	10hrs
	7.1 Reading:Computer use in the car industry								
	7.2 Language SpotPast passive								
	7.3 Speaking:Working on a help desk								
	7.4 Vocabulary:Collocations and words ends with -ed								
	Chapter 8: The future of Technology:	1,2,4&6	1hr		3hrs			6hrs	10hrs
	8.1 Listening: The prediction about technology								
	8.2 Language Spot: Phrasal verbs								
	8.3Vocabulary:Affixes								
	8.4 Speaking: Saying good bye								
	Total								
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Tests: (Vocabulary 5%, Reading 10% and Grammar 10%)	25	✓		1:30 hrs
	2	Assignments: (Reading 5% and Writing 5%)	10		✓	10 hrs
	3	Quizzes: (Listening (2) 10% and Writing (1)	15	✓		1:00 hrs
	4	Presentation	10	✓		3:00 hrs
				Total	20:30 hrs	

	Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam	40	✓		2:30 hrs
				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	1.	Computer Lab
		2.	Software
13	Text book and references:	1	Cystal, D. (1997).*English as a Global Language*: Cambridge University Press: Cambridge.
		2	Eric H. Glendenning, (ND) *Oxford English For Careers*: Technology 1: OUP
		3	Gideon (2015). *English Language And Grammar*: Koros Press Limited: United Kingdom.
		4	Julia.W (1993). *Everyday Consumer English:* College of Lake County: Pitts Burgh.

Adama Science and Technology University		
1	School: ***Humanities and Social Science***	Department: ***Humanity Unit***

2	Course Category	***General***
	Course Name	***Introduction to Civics and Ethics Studies***
	Course Code:	***LART 1001***
3	**Synopsis:**	This course is designed for undergraduate students with the aim of familiarizing learners to the essence of ethics and citizenship rights and responsibilities. It will help students to acquire a necessary ethical qualities and civic competences while dealing with 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 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:**	

	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
	CLO 5	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.
	CLO 6	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)	Program Learning Outcomes (PO)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assignment	Mid Exam	Final Exam
CLO1			✓			✓			✓	✓			✓	✓	✓	✓	✓

	CLO2			✓			✓			✓					✓	✓	✓	✓
	CLO3									✓				✓	✓		✓	✓
	CLO4							✓		✓	✓		✓	✓				✓
	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	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)								
	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: Understanding Ethics and Morality 1.1.Defining Civics, Ethics, Morality and amorality	1 &2	1hr					1 hr	2 hr

	1.2.Origin and Development of Civics and Ethical Education								
	1.3.Approach to Ethics 1.3.1. Normative ethics ▪ Teleological Ethics (Consequentialist) ▪ Deontological Ethics (Non-Consequentialist)	1&2	2hr	2hr		1hr		2 hr	7 hr
	1.3.2. Non-Normative Ethics ▪ Meta Ethics ▪ Absolutism/Objectivism 1.3.3. Issues in Applied Ethics ▪ Development Ethics ▪ Environmental Ethics ▪ Professional Ethics	1&2	2hr	2hr		1hr		1 hr	6 hr
	1.4 Ethical Principles and Values of Moral Judgments Why Should I act ethically?	1&2	1hr					1 hr	2 hr
	Chapter Two: State and Government **2.1 Understanding State** ▪ Meaning and Attributes of State	3	1hr					2 hr	3 hr

	▪ Theories on the Origin and development of state								
	2.2. State Structures: Unitary; Federal and Con-federal	3	1hr					2 hr	3 hr
	2.3. Understanding Government ▪ Major Function and Purpose of Government	3	1hr					1 hr	2 hr
	2.4. Types of Government: Limited and Unlimited	3	1hr					1 hr	2 hr
	2.4. Systems of Government: Parliamentary, Presidential and Hybrid	3	1hr					1 hr	2 hr
	Chapter Three: Citizen and Citizenship 3.1.Understanding Citizenship ▪ Citizen and citizenship: right and responsibilities ▪ Competencies of Good Citizen	3&4	1hr	1hr				1 hr	3 hr
	3.2 The Genesis of Citizenship: Normative and Historical Evolution of Citizenship	3&4	1hr					2 hr	3 hr
	3.3. Approaches to citizenship: Liberal, Republican, Communitarian and Radical Democratic	3&4	1hr	1hr				3 hr	5 hr

	▪ Ancient, Medieval, Modern and Cosmopolitan Citizenship								
	3.4 Ways of Acquiring and Losing citizenship	3&4	1hr					2 hr	3 hr
	3.5 Citizenship in Ethiopia's Politico-Legal Context	3&4	1hr					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 ▪ The Constitutional Experience of Ethiopia: pre and post 1931	1,2,3&4	2hr					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			1hr		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	1hr	1hr		1hr		2 hr	5 hr
	Chapter Five: Understanding International Relations and Foreign Policy 5.1.The Nature and Evolution of International Relations	1,3,4 5&6	1hr			1hr		2 hr	4 hr
	5.2.Actors of International Relations: State and Non-State Actors	1,3,4 5&6	1hr					1 hr	2 hr

	5.3.Levels of Analysis in the International Relation	1,3,4 5&6	1hr					2 hr	3 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	2hr	2hr		1hr		2 hr	7 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	2hr	1hr		1hr		2 hr	6 hr
	5.6 A Survey of Foreign Policy and Diplomacy of Ethiopia: Past and present	1,3,4 5&6	1hr					2 hr	3hr
	Chapter Six: Major Contemporary	1,3,4							

	Global Issues **6.1 Globalization and Regionalism** ▪ The Convergence, Divergence and Overlapping relations of Regionalization and Globalization	5&6	2hr					2 hr	4 hr
	6.2.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	2hr					2 hr	4 hr
	▪ **Environmental Issues** ✓ Climate Change and Global warming	1,3,4 5&6	1hr					1 hr	2 hr
	▪ **Technology Related Issues** ✓ Cyber Crime and Cyber Security	1,3,4 5&6	1hr					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,	1hr					1 hr	2 hr
								Total	**100** hr

Assessment

Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests (2)	10	✓		1hr
2	Group assignments	10		✓	10 hr
3	Individual assignment	10		✓	8 hr
4	Mid exam	20	✓		1 hr
				Total	**20** hr

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	50%	✓		**2** 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	1	Adama Science and Technology university: Introduction to Civics and Ethics (Module) LAR 1001.
		2	Introduction to Global Trends module IRGI 1021

13	Text book and reference: (note: ensure the latest edition /publication)	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
		20	Isin E. F. &Turne, B. S. 2003.Handbook of Citizenship Studies. Sage Publisher.pp.1-87

Adama Science and Technology University		
1	School: ***School of Humanities and Social Science***	Department: ***Humanities Unit***
2	Course Category	***General Mandatory***
	Course Name	***Entrepreneurship and Business Development***
	Course Code:	***SOSC5003***
3	Synopsis:	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. The course also 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. This course will 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 and Year offered:	Semester: Choose an item. Year: Choose an item.
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:	
	CLO-1	Analyze the concept of entrepreneurship and develop a mindset that would consider entrepreneurship as a possible future career choice.
	CLO-2	Apply the concept of start-up ideas development and feasibility analysis in crafting viable business model that underpins entrepreneurial venture establishment.
	CLO-3	Explain the basic aspects of innovation and its significance role in opportunities recognition and prototype development.
	CLO-4	Explain and analyze start-up precautionary aspects that would further contribute towards creating and growing an entrepreneurial venture.
	CLO-5	Apply the concept of elevator pitch to communicate the value the new venture provides to customers, investors and other stakeholders.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Mid	Assignment	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	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						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Entrepreneurship: an overview	1	**9h**			**2h**	**3h**	**15h**	**29h**
	1.1 Meaning & Importance of Entrepreneurship		2h			-	-	3h	5h
	1.2 Characteristics of Successful Entrepreneurs		2h			-	1	5h	8h

	1.3 Entrepreneurial Motivation		3h			2h	1h	5h	11h
	1.4 Understanding an Entrepreneurial Process		2h			-	1h	2h	5h
	Chapter 2: Business Idea Generation and Selection	1,2&5	**12h**			**5h**	**4h**	**15h**	**36h**
	2.1 Developing start-up ideas		2h			-	2h	4h	8h
	2.2 Types and Sources of start-up ideas		2h			2h	-	2h	6h
	2.3 New Product Development (NPD) Process		3h			-	-	2h	5h
	2.4 Value Analysis and Reverse Engineering		3h			-	-	3h	6h
	2.5 Business Concept Statement		2h			3h	2h	4h	11h
	Chapter 3: Innovation and Pre Start-up	2 &3	**12h**			**5h**	**4h**	**15h**	**36h**
	3.1 Innovation and its type		3h			1h	1h	4h	9h
	3.2 Market Research (An Overview)		2h			-	-	2h	4h
	3.3 Business Model Development (Business Canvas)		4h			2h	2h	5h	13h
	3.4 Business Planning		3h			2h	1h	4h	10h
	Chapter 4: Start-up Considerations	4	**15h**			**3h**	**4h**	**20h**	**42h**
	4.1 Marketing		3h			1h	2h	4h	10h
	4.1.1 Marketing Mixes (The 4P's)								
	4.1.2 Marketing Strategies (Targeting, Segmenting, and Positioning)								
	4.2 Operations		3h			1h	-	4h	8h

	4.2.1 Operations System								
	4.3 Finance		4h			1h	2h	5h	12h
	4.3.1 Financing a new venture (Types of finance)								
	4.3.2 Sources and Use of Finance								
	4.4 Human Resource		2h			-	-	3h	5h
	4.4.1 HR Planning								
	4.4.2 Employee Handling								
	4.5 Legal		3h			-	-	4h	7h
	4.5.1 Forms of Business Ownership								
	4.5.2 Licensing & Registration								
	4.5.3 Intellectual property (IP) Rights								
		Total	**48h**			**15h**	**15h**	**65h**	**143h**

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Tests (1 & 2)	10%	1h	-	1h
2	Individual Assignment	15%	-	5h	5h
3	Project (Business Model Development & Presentation)	25%	2h	5h	7h
				Total	13h
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50%	2	-	2h
				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 and reference: (note: ensure the latest edition /publication)	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	School: Humanities and Social Science		Department: Humanities Unit
2	Course Category	General Mandatory	
	Course Name	Health and Physical Education I	
	Course Code:	HPEd 1011	
3	Synopsis:	This course is design to acquaint students with the nature and knowledge of physical fitness for better health. This course is also encompasses health-related physical fitness components which are important for better life and health. This health- related physical fitness includes cardio-respiratory endurance, muscular strength, muscular endurance	

		and flexibility. In addition to health-related fitness components, this course is also deal with the high lights of basic gymnastic activities.																
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:																	
	CLO1	Understand the knowledge of physical fitness and its benefits.																
	CLO2	Improve their physical fitness and wellness for better quality life.																
	CLO3	Choose appropriate physical activity for their regular physical activity program.																
	CLO4	Develop positive attitude towards physical activity and participation.																
	CLO5	Develop positive social relationship and work cooperatively with others.																
	CLO6	Show appropriate safety measures for effective regular physical exercise programs.																
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																	
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Teaching Methods	Assessment			
															Test	Quiz	Assignment	Project	Lab-report

														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 (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						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter One: An overview of physical fitness and its benefits	CLO 1							
	1.1 Defining physical fitness and its components		2h					5h	7h

	1.2 Benefits physical Fitness		2h					4h	6h
	Chapter Two: Cardiorespiratory Endurance	CLO 2 to CLO 6							
	2.1 walking, jogging, running,				4h			7h	11h
	2.2 Aerobic games,				2h			4h	6h
	2.3 Aerobic dance, etc.				2h			4h	6h
	Chapter Three: Muscular strength and endurance.	CLO 2 to CLO 6							
	2.1 Exercises that can improve once upper body part				2h			5h	7h
	3.2 Exercises that can improve once abdominal and back body part				2h			5h	7h
	3.3 Exercises that can improve once Lower body part				2h			5h	7h
	Chapter Four: Flexibility	CLO 2 to CLO 6							
	4.1 Exercises that can improve flexibility include different stretching activities				4h			8h	12h
	Unit Five: Gymnastics	CLO 2 to CLO 6							
	5.1 Forward roll				2h			5h	7h

	5.2 Backward roll				2h			5h	7h
	5.3 Cartwheel				2h			5h	7h
								Total	90h

Assessment

	Continuous Assessment		Percentage Total-80(%)	F2F	NF2F	SLT
	1	Assignments	10%		6h	6h
	2	Tests	10%	1h		1h
	3	Tests	20%	1h		1h
	4	Attendance	40%			
	5	Choose an item.				
	Total					8h
	Final Exam		Percentage 20 (%)	F2F	NF2F	SLT
	Final Exam		20%	2h		2h
	Grand Total SLT					120h
	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	Choose an item.
		2	Choose an item.
		3	Choose an item.

	computer lab, simulation room …etc.)	4	Choose an item.
		5	Choose an item.
13	Textbook and reference: (note: ensure the latest edition /publication)	1	Dale B, Hahn (1999). Focus on health 2nd ed.
		2	Frank Gallugna (2000). Advanced PE for Edexcel.
		3	Thomas D, Paul M, Walton T (2007). Fit & Well; Core Concepts and Labs in physical Fitness and Wellness 7th Edition

Adama Science and Technology University						
1	School: ***Humanities and Social Science***			Department: ***Humanities Unit***		
2	Course Category	***General Mandatory***				
	Course Name	***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:**	
	CLO1	Appreciate the importance of logic and critical thinking
	CLO2	know how to construct valid arguments of their own
	CLO3	Analyze the proper use of language for effective communication
	CLO4	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 program Learning Outcomes, Teaching Methods and Assessment:**	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
													Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	L	T	P	O	Test	Mid	Assignment	Project	Final exam
CLO1						✓							✓				✓	√	✓		√
CLO2				✓										✓				√	✓		√
CLO3										✓			✓	✓			✓	√	✓		√
CLO4								✓					✓	✓		✓	✓		✓		√

	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 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 hour
	1.2 Recognizing Arguments	1				1hr		1 hours	2 hour
	1.3 Deduction and Induction	1	1hr					2 hour	3 hour
	1.4 Validity, Truth, Soundness, Strength, Cogency	1	1hr			1hr		1 hours	3 hour
	Chapter 2: **Language: Meaning and Definition**	1&3							

	2.1 Cognitive and Emotive Meaning		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					2 hours	3 hours
	2.5 Criteria's for Good Lexical Definitions	3&5						2 hours	2 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					2 hours	3 hours
	3.3 Fallacies of Weak Induction	3,4,5	1hr			1hr		1 hours	3 hours
	3.4 Fallacies of Presumption	4,5,6	1hr					2 hours	3 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 Categorical Propositions	1,4	1hr			1hr		2 hours	4 hours
	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		2hours	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		3 hours	5 hours
	5.3Rules and Fallacies	4&5	1hr					2 hours	3 hours
	5.4 Reducing the Number of Terms	4&6						3 hours	3 hours
	5.5 Enthymemes and Sorites	2						2 hours	2 hour
	Chapter six: Propositional Logic 6.1 Symbols and Translation	1-6	1hr			1hr		3 hours	5 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		2 hours	3 hours
	6.6 Natural Deduction	2,4,6	1hr					2 hours	3 hours
								Total	96 hours

	Assessment					
	Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
	1	Tests (2)	10	✓		1 hour
	2	Group assignments	10		✓	10 hours

	3	Individual assignment	10	✓		10 hours
	4	Mid exam	20	✓		1 hours
					Total	**22** 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	
		3	
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	School: ***Humanities and Social Science***	Department:

2	Course Category	***General Mandatory***				
	Course Name	***Health and Physical Education II***				
	Course Code:	***HPEd 1022***				
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 governing the game.				
4	Name(s) of Academic Staff:	Anteneh Million, Daniel Mamo, Destaw Mekonnen, Elias Fekade, Eshetu Tadesse,				
5	Semester and Year offered:	Semester:	II	Year:	1	
6	Credit Hour:	0 cr.hr				
7	Prerequisite/ Co-requisite: (if any)	HPEd 1011				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Understand the value of playing ball games and its basic rules. (WA 1)				
	CLO2	Improve their physical fitness and wellness for better quality life. (WA 12)				
	CLO3	Demonstrate basic techniques of volleyball, basketball, football and hand ball games. (WA 5)				
	CLO4	Develop positive attitude and participate in deferent ball games. (WA 1)				

	CLO5	Improve team work and show Respect to their colleagues. (WA 9)
	CLO6	Use their leisure time properly and appropriate safety measures in playing ball games. (WA 3)
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√												√								
CLO2											√				√	√					
CLO3												√			√	√					
CLO4								√							√	√					
CLO5									√						√	√					
CLO6	√														√	√					

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	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter One: Volleyball	CLO 1 to CLO 6	1h						
	1.1 Passing				2h			4h	6h
	1.2 Serving				1h			3h	4h
	1.3 6 vs 6 game				1h			3h	4h
	Chapter Two: Hand ball	CLO 1 to CLO 6	1h						
	2.1 Passing				2h			4h	6h
	2.2 Receiving				1h			3h	4h
	2.3 Shooting				1h			3h	4h
	2.4 7 vs 7 game				1h			3h	4h
	Chapter Three: Basketball	CLO 1 to CLO 6	1h						
	2.1 Passing				2h			4h	6h
	3.2 Dribbling				2h			4h	6h
	3.3 Shooting				1h			4h	5h
	3.4 5vs 5 game.				1h			3h	4h

Chapter Four: football	CLO 1 to CLO 6	1h						
4.1 Passing				2h			4h	6h
4.2 Controlling				2h			4h	6h
4.3 Dribbling				2h			4h	6h
4.4 Heading				1h			4h	5h
4.5 Shooting				1h			4h	5h
4.6 Small sided games				1h			4h	5h
Total		4h		24h				90h

Assessment

Continuous Assessment		Percentage Total-80(%)	F2F	NF2F	SLT
1	Assignments	10%		6h	6h
2	Tests	10%	1h		1h
3	Tests	20%	1h		1h
4	Attendance	40%			
5	Choose an item.				
				Total	8h
Final Exam		Percentage 20 (%)	F2F	NF2F	SLT

	Final Exam	20%	2h		2h
				Grand Total SLT	100h
	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	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

1	School: Electrical Engineering and Computing	Department: Electronics and Communication Engineering
2	Course Category	General Mandatory
	Course Name	Basic Writing Skills
	Course Code:	EnLa-1002

3	Synopsis/ Course Description	Basic Writing Skills course aims at developing students' basic writing skills in context of engineering. The course gives students the language writing skills they need to study engineering. 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); 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 (ENLA 1001)				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to:					
	CLO1	Write grammatically and structurally correct sentence (PLO10)				
	CLO2	Identify and correct common sentence errors in paragraphs and essays (PLO10)				
	CLO3	Write coherent, unified and complete paragraphs of different types in engineering context (PLO10)				
	CLO4	Identify basic structures and elements of paragraph and essay.(PLO10)				
	CLO5	Write different types of essays in engineering context (PLO10)				

9

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	Teaching Methods				Assessment				
													L	T	P	O	Test	Quiz	Assignment	Mid	Final
CLO1										√			✓		✓		✓	✓		✓	✓
CLO2										√			✓		✓		✓	✓		✓	✓
CLO3										√			✓		✓		✓		✓	✓	✓
CLO4										√			✓		✓		✓	✓	✓		✓
CLO5										√			✓		✓				✓		✓

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	Writing Skills
2	Written Communication 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		4hrs	9hrs

	Chapter 1: **Sentences:** 1.1 Definition of Sentence 1.2 Sentence Types	1	3hrs		2hrs				
	Chapter 2:**Combining Sentences** 2.1 Coordination 2.2Coordinating Conjunction 2.3Subordination Conjunction	1	2hrs		2hrs			3hrs	7hrs
	Chapter 3: **Common Sentence Errors** 3.1 Fragment 3.2Run on 3.3Comma splices misplaced modifier 3.4 Dangling modifier 3.5 Faulty parallelism 3.6 Faulty reference pronoun 3.7 Faulty agreement 3.8 Shifts	1,2	4hrs		5hrs			15hrs	20 hrs
	Chapter 4: **Paragraph Writing** 4.1Paragraph Structure 4.2 Characteristics of effective Paragraph 4.3 Steps in writing paragraph 4.4 Types of paragraph	3,4	5hrs		10:30 hrs			20hrs	35:30 hrs
	Chapter 5:**Essay Writing** 5.1 Components of Essay	3,4,5	2hrs		3hrs			14hrs	19 hrs

	5.2 Essay outline 5.3 Types of Essay											
											Total	94:30 hrs
	Assessment											
	Continuous Assessment		Percentage Total-60(%)		F2F		NF2F		SLT			
	1	Quizzes (Sentence (2) 10% and Paragraph (1) 5%	15		✓				1hr			
	2	Tests (sentence 10% , Paragraph 8% , paragraph structure and elements 7%)	25		✓				2hrs			
	3	Assignments (paragraph (2) 10%, Essay (1) 10%)	20				✓		20hrs			
								Total	23hrs			
	Final Exam		Percentage 40 (%)		F2F		NF2F		SLT			
	Final Exam		40		✓				2:30 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	1	Computer Lab									
		2	Software									
13	Text book and reference:	1	Ahmed, Jameel. (2009). ***Teaching of English***. New Delhi: A.P.H Publishing Corporation									
		2	Baaklini, Hegan, Gina. (2013). *Building Better Paragraphs*. Boston: Wadsworth Cengage Learning.									
		3	Bayley, Stephen. (2003). ***Academic Writing**: A Practical Guide for Students*.									

		4	London: Nelson Thornes Ltd.
		5	Brandon, L. and Brandon, K. (2005). ***Paragraph and Essays***. Boston: Wadsworth Cengage Learning.

<table>
<tr><td></td><td colspan="15">Adama Science and Technology University</td></tr>
<tr><td>1</td><td colspan="8">School: SoEEC</td><td colspan="7">Department: EPCE</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">Course Category</td><td colspan="13">Basic Mandatory School Req.</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="13">Fundamentals of Electrical Engineering</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="13">EPCE2101</td></tr>
<tr><td>3</td><td colspan="2">Synopsis:</td><td colspan="13">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.</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">I</td><td>Year</td><td colspan="3">2</td><td colspan="4"></td></tr>
<tr><td>6</td><td colspan="2">Credit Hour:</td><td colspan="13">4 (2hr Lecture, 3hr Tutorial and 3hr Laboratory</td></tr>
<tr><td>7</td><td colspan="2">Prerequisite:</td><td colspan="13">Maths1102 and Phys1101</td></tr>
<tr><td rowspan="7">8</td><td colspan="15">Course Learning Outcome (CLO): At the end of the course the student will be able to:</td></tr>
<tr><td>CLO1</td><td colspan="14">Discuss basic concepts of electrical engineering and circuit elements</td></tr>
<tr><td>CLO2</td><td colspan="14">Analyze the fundamental and derived circuit laws, and theorems to the analysis of DC circuits.</td></tr>
<tr><td>CLO3</td><td colspan="14">Analyze first and second order transient circuits and calculate voltage and current of these circuits.</td></tr>
<tr><td>CLO4</td><td colspan="14">Discuss the fundamental circuit laws and theorems to the circuit and power analysis of steady state single phase ac circuits.</td></tr>
<tr><td>CLO5</td><td colspan="14">Analyze basic polyphase circuits and calculate circuit parameters of balanced and unbalanced three phase circuits</td></tr>
<tr><td>CLO6</td><td colspan="14">Discuss the basic electromagnetic phenomenon, and resonance circuits</td></tr>
<tr><td rowspan="3">9</td><td colspan="15">Mapping of the course learning outcomes to the program Learning Outcomes, Teaching Methods, and Assessment:</td></tr>
<tr><td rowspan="2">Lear ning Outc</td><td colspan="14">Program Learning Outcomes (PO)</td></tr>
<tr><td>PO</td><td>PO</td><td>PO</td><td>PO</td><td>PO5</td><td>PO</td><td>PO</td><td>PO8</td><td>PO9</td><td>Teaching</td><td colspan="4">Assessment</td></tr>
</table>

											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)	
	1	Basic electrical circuit analysis and connection skill
	2	Pspice and workbench software skills
11	Distribution of Student Learning Time (SLT)	

Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided learning (NF2F)	Independent learning (NF2F)	SLT
		L	T	P	O			
Chapter One: Basic concepts of Electrical Engineering	CLO1	√	√					4hr
7.7 Introduction to electrical engineering 7.8 Basics of electric generation 7.9 Electrical quantities 7.10 Basic circuit elements								
Chapter Two: Circuit laws and methods of analysis	CLO2	√	√	√		√		24hr
a. Basic circuit laws i. Ohms law ii. Nodes, branches, and loops								

	iii. Kirchhoff's laws iv. Series resistors and Voltage divider rule v. Parallel resistors and current divider rule vi. Star-delta transformation b. Methods of analysis i. Nodal analysis: without and with a voltage source i. Mesh analysis: without and with current source								
	Chapter Three: **Circuit Theorems**	CLO2	√	√	√		√		20hr
	1. Linearity property 2. Superposition theorem 3. Source transformation 4. Thevenin's theorem 5. Norton's theorems 6. Maximum power transfer theorem								
	Chapter Four: **Transient Circuit Analysis**	CLO3	√	√	√		√		18hr
	1. First Order Circuits 2. Source free RL and RC circuits 3. Step response of RL and RC circuit 4. Second order circuits 5. Source free series and parallel RLC circuits 6. Step response of series and parallel RLC Circuits 7. Higher Order Circuits and Approximations								
	Chapter Five: **AC Steady State Analysis**	CLO4	√	√	√		√		18hr
	5: Introduction to Sinusoids 6: Sinusoidal and complex forcing functions 7: Phasors								

	3: Phasors representation for circuit elements 9: Impedance and admittance 0: Phasor diagrams 1: AC circuit analysis techniques								
	Chapter Six: **Steady State Power Analysis**	CLO4	√	√	√		√		12hr
	○ Instantaneous power ○ Average power and maximum average power transfer ○ Effective or RMS value ○ Complex power ○ Power factor and power factor correction								
	Chapter Seven: **Polyphase circuit**	CLO5	√	√	√		√		12hr
	○ Generation of three phase voltage ○ Three phase connections ○ Source and load connection ○ Power relationships in three phase system								
	Chapter Eight: **Electromagnetism**	CLO6	√	√	√		√		10hr
	○ Introduction to electromagnetism ○ Mutual inductance ○ Magnetically coupled circuits ○ Energy analysis								
	Chapter Nine: **Frequency response**	CLO6	√	√	√		√		14hr
	3.1 Introduction 3.2 Transfer function 3.3 Sinusoidal frequency analysis 3.4 Resonant circuits								
								Total	**Hr**
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Test	10		√	1hr
	2	Assignment	10		√	8hr
	3	Lab report	15		√	14hr
	4	Mid exam	25		√	2hr
					Total	**25hr**
	Final Exam		**Percentage 40(%)**	**F2F**	**NF2F**	**SLT**
	Final Exam		40%		√	**3hr**
					Total	**160hrs**
	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	Computer Lab
		2	Workshop
		3	
	Text book and reference: (note: ensure the latest edition /publication)	1	C. K. Alexander and M. N. O. Sadiku, fundamentals of circuit analysis, 10th edition, McGraw Hill,
		2	J. David Irwin, R. Mark Nelms, Basic engineering circuit analysis, 10th edition, John Wiley & Sons, Inc., 2011
		3	Robert Boylstad, Introductory circuit analysis, 10th edition, Pearson education, 2002
		4	A.E. Fitzgerald & D.E. Higginbotham, Arvin Grabel, Basic Electrical Engineering, 7th ed, Mcgraw hill companies, 2009
		5	Charles Seymour Siskind, Electrical Circuits, 2nd ed, McGraw-Hill,
		6	Cook and Carn, Elements of Electrical Engineering, 6th Edition, John Wiley & Sons, Inc.

	Adama Science and Technology University	
1	School: SoEEC	Department: Computer Science and Engineering

2	Course Category	Basic					
	Course Name	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 and Year offered:	Semester:	II	Year:	1		
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	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)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods				Assessment				
													L	T	P	O	Test	Quiz	Assignment	Project	Lab-report

	CLO1	√												√			√	√		√		
	CLO2		√											√		√						
	CLO3	√												√		√			√	√		
	CLO4		√											√		√		√				√
	CLO5			√										√		√			√	√		
	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	
	2	
	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:Problem Solving and Computer Programming 1.1Problem solving life cycle	CLO1							8hrs
	1.2 Basics of programming language								
	Chapter 2:Basics of C++ programming 2.1Modular program	CLO2							9hrs
	2.2 The main function								
	2.3Identifiers								
	2.4 program output using cout ,Data types, Arithmetic operations, variables ,Assignment								

	operations								
	Chapter 3:Input/output and Functions 3.1Using library functions	CLO2							10hrs
	3.2Input using the cin Object, Symbolic Constants								
	3.3Writing Functions ,Variable Scope and life time								
	Chapter 4:Control Statements 4.1Branching structure	CLO3							9hrs
	4.2 Looping Structure								
	Chapter 5:Arrays and Pointers 5.1 Arrays	CLO4							9hrs
	5.2Pointers								
	Chapter 6:Files and Streams 6.1 I/O File stream objects and functions	CLO5							7hrs
	6.2 Reading and writing Character based files								

	, Random file access								
	6.3 File Streams as function arguments								
	Chapter :7 Structure and Object oriented programming I 7.1 Structure	CLO5 and CLO6							9hrs
	7.2 Object Oriented programming I								
	Total								

Assessment

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)	2hrs	5hrs	7hrs
	2	Assignments	Assignment II (10%)	2hrs	5hrs	7hrs
	3	Project	15%	2hrs	20hrs	22hrs
	4	Others	Mid Exam (25%)	2hrs	8hrs	10hrs
	5	Choose an item.				
					Total	46hrs

<table>
<tr><td rowspan="3"></td><td></td><td>Percentage (%)</td><td>F2F</td><td>NF2F</td><td>SLT</td></tr>
<tr><td>Final Exam</td><td>40%</td><td>3hrs</td><td>10hrs</td><td>13hrs</td></tr>
<tr><td colspan="4">Grand Total SLT</td><td>120hrs</td></tr>
<tr><td></td><td colspan="5">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.</td></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)</td><td>1</td><td colspan="3">Choose an item.</td></tr>
<tr><td>2</td><td colspan="3">Choose an item.</td></tr>
<tr><td>3</td><td colspan="3">Computer Lab</td></tr>
<tr><td>4</td><td colspan="3">C++ IDE</td></tr>
<tr><td>5</td><td colspan="3">Choose an item.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Text book and reference:

(note: ensure the latest edition /publication)</td><td>1</td><td colspan="3">1. B. Stroustrup. 2013. The C++ Programming Language 4th Edition, Addison-Wesley.
2. Bronson G. J. 2013. C++ for Engineers and Scientists, 4th Edition. Thomson Learning, Stamford, CT.
3. D.S.Milak.2017. C++ Programming: Program Design Including Data Structures 8th Edition. Cengage Learning.</td></tr>
<tr><td>2</td><td colspan="3">http://ocw.mit.edu/courses/electrical -engineering-and-computer-science/6-096-introductio-to-c-january-iap-2011/</td></tr>
</table>

			https://www.tutorialspoint.com

***School required courses*:**

Adama Science and Technology University						
1	School: ***SoEEC***		***Department: CSE***			
2	Course Category	***Basic***				
	Course Name	***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 and Year offered:	Semester:	I	Year:	2	
6	Credit Hour:	3				
7	Prerequisite/ Co-	CSEg 1104				

	requisite: (if any)	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	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)	Program Learning Outcomes (PO)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√								√		√	√	√		√		
CLO2		√							√							√	

	CLO3			√						√				√		√		
	CLO4			√						√		√			√	√		
	CLO5	√								√		√		√		√	√	
	Indicate the relevance 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	Teaching and Learning Activities							Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)		
			L	T	P	O				

	Chapter 1:**Introduction** 1.1Data structure definition, ADT, classification of Data structures(primitive vs. non primitive, properties of algorithm. Algorithm complexity analysis (operation count, big-O, theta, omega), best case analysis, worst case analysis, average case analysis	CLO 1 and CLO 2							9hrs
	1.2 Linear vs nonlinear Data Structures), Array revision, pointer revision, Algorithm definition, properties of algorithms, expressing algorithms (natural language, flowchart, pseudocodes),								
	Chapter 2:**Simple Searching and Sorting Algorithms** Linear Search, Binary Search, Bubble	CLO 5							9hrs

	sort, Insertion sort, Selection sort								
	Chapter 3: **List Data Structure** List ADT by the array, Dynamic memory, limitations of array, implementation of lists, Linked list:- Singly linked lists, doubly linked lists, circular (singly and doubly) linked lists, Operations on linked lists: creation, insertion, deletion, update, search, adding new nodes	CLO 3							12hrs
	Chapter 4:**Stack Data structure:** Stack definition, Applications, operations on the stack, implementation of a stack using array, Stack implemented using linked lists, applications of stacks, conversion and evaluation of	CLO 3							9hrs

	infix, postfix and prefix expressions using stack, recursive functions								
	Chapter 5:**Queue Data Structure** Queue definition, applications, operations on queue, Queue implantation by array, queue implantation by linked lists, circular queue, priority queue	CLO 3							9hrs
	Chapter 6:**Tree Data Structure** Definition of tree, basic terminologies ,basic operations on tree: creation, insertion, deletion, update, search, print, Types of trees:- n-ary tree, Binary tree, BST, AVL tree, full BT, complete BT	CLO 4							9hrs

	,Balanced BT **.**Tree traversal methods: in-order, pre order, post-order Definition of tree, basic terminologies ,basic operations on tree: creation, insertion, deletion, update, search, print, Types of trees:- n-ary tree, Binary tree, BST, AVL tree, full BT, complete BT ,Balanced BT **.**Tree traversal methods: in-order, pre order, post-order								
	6.2 Heap data Structure:**-definition, creation, insertion, update, deletion, print etc. Examples of**								6hrs

	Expression trees								
	Chapter 7: **Graph data Structure** Graph definition, basic terminologies, representation of graph, operations on graphs: creation, insertion, deletion, traversal (DFS, BFS) Types of graphs: Cyclic and acyclic graphs, directed and undirected graphs, complete graph, balanced graph	CLO 4							6hrs
	Dijkastra and prims algorithm								
	Chapter 8: **Advanced sorting Algorithms** Quick sort, Merge sort ,shell sort , Heap Sort	CLO 5							6 hrs
	Total							75hrs	
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)			6hrs
	2	Assignments	Assignment I (10%)			6hrs
	3	Project	10%			10hrs
	4	Others	Mid Exam (30%)			8hrs
	5	Choose an item.				
					Total	30hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%			15hrs
					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	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	
		2	Sahni, S. 2001. "Data Structures, Algorithms, and Applications in C++", WCB/McGraw-Hill. Sahni, S.2001. "Data Structures, Algorithms, and Applications in Java", WCB/McGraw-Hill. Drozdek, A.2002. "Data Structures and Algorithms in C++", Vikas Publishing House. Wirth, N.1985. "Algorithms and Data Structures", Prentice-Hall of India. Lafore, R.2007. "Data Structures and Algorithms in Java", 2nd Ed., Dorling Kindersle

Adama Science and Technology University		
1	School: ***SoEEC***	Department: ***Computer Science and Engineering***

2	Course Category	***Basic***				
	Course Name	***Discrete Mathematics for Computer Science***				
	Course Code:	***CSEg2210***				
3	Synopsis:	The course introduces the foundations of discrete mathematics as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include functions, relations, sets, simple proof techniques, Boolean algebra, propositional logic, digital logic, elementary number theory, the fundamentals of counting, predicate logic, recurrence relations, graphs, trees, matrices, computational complexity, elementary computability, and discrete probability.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	4	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Formal Language and Automata Theory				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Determine the number of logical possibilities of some event without necessarily identifying every case.				
	CLO2	Apply the pigeonhole principle, inclusion-exclusion principle for counting.				
	CLO3	Build a mathematical model of the phenomenon of chance or randomness (probability).				
	CLO4	Calculate the number of elements in a sample space and in an event of a sample space.				
	CLO5	Use the concept of recursion in solving counting problems.				
	CLO6	Apply graph coloring, depth first search algorithms to searching problems.				

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

CLO	Program Learning Outcomes (PO)																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods				Assessment				
										L	T	P	O	Test	Quiz	Assignment	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 (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)

1	Problem solving and analysis skill
2	Determining computational complexity
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: **Relations and Elementary Counting Principles** 1.1 Set relations 1.2 Set operations 1.3 Elementary counting principles 1.3.1 Addition and multiplication principles 1.3.2 Permutations and combinations 1.3.3 The binomial theorem 1.4 The inclusion exclusion principle	CLO1	12hrs				4hr	6hrs	22hrs
	Chapter 2: **Probability** 2.1 Definition of probability terms 2.2 Counting rules: Addition and Multiplication rules 2.3 Probability of an event 2.4 Some probability rules 2.5 Conditional probability and independence	CLO2	12hrs				6hrs	8hrs	26hrs
	Chapter 3: **Recurrence Relation**	CLO3	12hrs				6hrs	8hrs	26hrs

	3.1 Linear recurrence relations with constant coefficients 3.2 Solutions of inhomogeneous recurrence relations 3.3 Expectation of random variable								
	Chapter 4: **Elementary Graph Theory** 4.1 Basic terminology 4.2 Digraphs 4.3 Basic properties of graphs and digraphs 4.4 Isomorphism 4.6 Planar graphs	CLO4	12hrs				2hrs	8hr	22hrs
	Chapter 5: **Circuits and Graph Coloring** 5.1 Basic terminology 5.2 Eulerian path and circuits 5.3 Hamiltonian paths and circuits 5.4 Graph coloring theorems	CLO5							
	Chapter 6: **Trees** 6.1 Properties of trees 6.2 Rooted trees 6.3 Spanning trees	CLO6							

	Chapter 7: **Matrices and Graphs** 7.1 Matrices 7.2 Application of graphs as models	CLO6							
	Total		48hrs				18hrs	30hrs	96hrs

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Assignments (2)	10%		√	5hrs
2	Test 1	10%	√		2hr
3	Test 2	10%	√		2hr
4	Mid Exam	20%	√		3hrs
				Total	12hrs
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		50%	3hrs	5hrs	8hrs
				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	1	
		2	
		3	
		4	

		5	
13	Text book and reference: (note: ensure the latest edition /publication)	1	Kenneth Rosen. Discrete Mathematics and Its Applications, 7th Edition , McGraw Hill Publishing Co., 2012.
		2	Albertson, M.O &Hutschinson, J.P: Discrete Mathematics with Algorithims
		3	Shiflet, A.B: Discrete Mathematics for Computer Science
		4	Mattson, H.F. Discrete Mathematics with Applications
		5	Galati R. Bodh; Finite Mathematics: An Introduction

***Major Mandatory/Elective Courses*:**

1	Course Category	***Basic Course***				
	Course Name	***Probability and Random Processes***				
	Course Code:	***ECEg4102***				
2	Synopsis:	This is include: History of statistics, Meaning of statistics; Methods of data collection; Methods of data presentation; Measures of location; Measures of variation; Moments, skewness and kurtosis; terminologies in probability; Counting Techniques; definition of Probability (approaches to probability); Probability distributions; Sampling and Sampling Distribution of the mean and proportion; Elementary description of the tools of statistical inference: Basic concepts; Estimation: (Point and Interval) for the population mean and proportion; Hypothesis testing on the population mean and proportion; Simple linear regression, correlation and rank correlation.				
3	Name(s) of Academic Staff:	Mr. Desta Nigusu; (Mr. Bacha Edosa, Mr. Meseret Taddese, and Dr. Tatek Getachew Mr. Deme Kedir)				
4	Semester and Year offered:	Semester:	I	Year:	2	
5	Credit Hour:	3				
6	Prerequisite/ Co-requisite: (if any)	None				

7	**Course Learning Outcome (CLO): At the end of the course the student will be able to do:**	
	CLO_1	Have a broad knowledge of the basic understanding of statistical techniques demonstrated through principles of data collection, descriptive statistics, inferential. statistics linear regression, correlation, computation and data analysis;
	CLO_2	Identify different techniques of sampling and understand the methods of data collection, organization, presentation, analysis and interpretation;
	CLO_3	Differentiate among common types of data, and summarize and display them appropriately;
	CLO_4	Learn some desirable properties and uses of measures of central tendency and measures of variation for the population data as well as sample data;
	CLO_5	Have basic skills in exploratory data analysis and problem solving; estimation and hypotheses testing for population parameter.
	CLO_6	Understand the basic concept of probability, random variable and its type, probability distribution (discrete & continuous), apply probability density function and probability mass function, and apply some common probability distribution to solve real problems;

<table>
<tr><td rowspan="4">8</td><td colspan="19">Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:</td></tr>
<tr><td rowspan="3">Course Learni</td><td colspan="18">Program Learning Outcomes (PO)</td></tr>
<tr><td rowspan="2">PO1</td><td rowspan="2">PO2</td><td rowspan="2">PO3</td><td rowspan="2">PO4</td><td rowspan="2">PO5</td><td rowspan="2">PO6</td><td rowspan="2">PO7</td><td rowspan="2">PO8</td><td rowspan="2">PO9</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">Teaching Methods</td><td colspan="5">Assessment</td></tr>
<tr><td>Te</td><td>Qu</td><td>Assig</td><td>Proj</td><td>La</td></tr>
</table>

	ng Out co mes (CL O)													L	T	P	O	st	i z	nm ent	ect	b - r e p o r t
	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																					

9	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Sampling technique and procedure
	2	Research methodology
	3	

10	Distribution of Student Learning Time (SLT)								
			Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
	Course Content Outline	CLO	L	T	P	O			
	1. Introduction to Statistics	**CLO1**	**3**	**2**				**1**	**6**
	1.1 History, definition and classification of statistics.		0.5						
	1.2 Stages in statistical investigation.		05						
	1.3 Definition of some basic terms in statistics.		0.						

			5						
	1.4 Types of variable and Scales of measurement		1	1					
	1.5 Applications, uses and limitations of statistics		0. 5	1				1	
	2. **Methods of Data Collection and Cresentation**	**CLO3**	**3**	**2**				**4**	**9**
	2.1 Methods of data collection 2.1.1 Source of data 2.1.2 Types of data 2.1.3 Methods of data collection		1	1				2	
	2.2 Methods of data presentation 2.2.1 Introduction 2.2.2 Frequency distributions: 2.2.3 Diagrammatic presentation of data: Bar charts, pie-chart, pictogram, Steam and leaf plot 2.2.4 Graphical presentation of data: Histogram, Frequency polygon, Ogive Curve.		2	1				2	
	3. **Measure of Central Tendency**	**CLO4**	**3**	**2**				**2**	**7**

	3.1 Introduction		0.5						
	3.2 Objectives of measuring central tendency		0.5	0.5					
	3.3 Important characteristics of measures of central tendency		0.5	0.5					
	3.4 Types of measures of central tendency 3.4.1 The mean (Arithmetic, weighted, Geometric and Harmonic) 3.4.2 The mode 3.4.3 The Median 3.4.4 The quantiles (quartiles, déciles, percentiles)		1.5	1				2	
	4. **Measure of Variation**	**CLO4**	**4**	**2**				**2**	**8**
	4.1 Introduction		0.5						
	4.2 Objectives of measuring variation		0.5						

	4.3 Absolute and relative measures		1						
	4.4 Types of measures of variation 4.4.1 The range and relative range 4.4.2 The mean deviation and coefficient of mean deviation 4.4.3 The variance, the standard deviation and the coefficient of variation 4.4.4 The standard Z- score		2	2				2	
	5. **Elementary Probability**	**CLO_6**	**6**	**4**				**5**	**15**
	5.1 Introduction		0.5						
	5.2 Definition and some concepts of Probability		2	1				2	
	5.3 Counting rules		1						
	5.4 Approaches in probability definition (Subjective, classical, frequentist and Axiomatic)		1	1				1	
	5.5 Some probability rules		0.5	1				1	
	5.6 Conditional probability and independence		1	1				1	

	6. **Random Variables and Probability Distributions.**	**CLO$_6$**	**12**	**6**			**3**	**5**	**26**
	6.1 One-dimensional Random Variables 6.1.1 Random variable: definition and distribution function 6.1.2 Discrete random variables and probability mass function 6.1.3 Continuous random variables and probability density function 6.1.4 Expected value, and variance of a discrete random variable 6.1.5 Expected value, and variance of a continuous random variable		6	2			1	2	
	6.2 Common Probability distributions 6.2.1 Common Discrete Distributions and their Properties 6.2.1.1 Binomial distribution 6.2.1.2 Poisson distribution 6.2.1.3 Geometric distribution		3	2			1	2	

	6.2.2 Common Continuous Distributions and their Properties 6.2.2.1 Uniform distribution 6.2.2.2 Normal distribution 6.2.2.3 Exponential distribution		3	2			1	1	
	7. **Sampling and Sampling Distributions**	**CLO$_2$**	**3**	**2**				**3**	**8**
	7.1 Introduction		0.5						
	7.2 The Concept of Sampling		0.5	1					
	7.3 Reasons for Sampling		0.5						
	7.4 Sampling Techniques		0.5					1	
	7.5 Sampling Distribution of the mean and proportion		1	1				2	
	8. **Estimation and Hypothesis Testing**	**CLO$_5$**	**6**	**4**				**4**	**14**

	8.1 Introduction		1						
	8.2 Statistical Estimation (Point and Interval estimation for the population mean and proportion)		2	2				2	
	8.3 Hypothesis Testing (Basic Concepts in Hypothesis Testing, Hypothesis testing on the population mean and proportion)		3	2				2	
	9. **Regression and Correlation Analyses**	**CLO1**	**4**	**2**				**3**	**9**
	9.1 Simple linear regression analysis		2	1				1	
	9.2 Correlation analysis		1	0.5				1	
	9.3 Rank Correlation		1	0.5				1	
	Total		**44**	**26**			**3**	**29**	**102**

Assessment

Continuous Assessment		**Percentage** **Total-50(%)**	**F2F**	**NF2F**	**SLT**
1	Quize1	5	√		1
2	Quize2	5	√		1

	3	Assignments1	10		√	5
	4	Assignments2	10		√	6
	5	Tests	20	√		2
					Total	**15**
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam			√		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	
		2	
		3	
		4	
		5	

13	Text book and reference: (note: ensure the latest edition /publication)	❖ **Text Book**	
		1	Bluman, A.G. (1995). Elementary Statistics: A Step by Step Approach (2nd edition).Wm. C. Brown Communications, Inc.
		❖ **References:**	
		1	David, S.M., McCabe, P. and Craig, B. (2008). Introduction to the Practice of Statistics (6th edition). W.H. Freeman
		2	Eshetu W. (2000). Introduction to Statistics. Addis Ababa University Press.
		3	Freund, J.E and Simon, G.A. (1998). Modern Elementary Statistics (9th Edition).
		4	Gupta, C.B. and Gupta, V. (2004). An Introduction to Statistical Methods. Vikas Publishing House, Pvt. Ltd, India.

Adama Science and Technology University			
1	School: ***Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***
2	Course Category	***Major Mandatory***	
	Course Name	***Object Oriented Programming***	
	Course Code:	***SEng2202***	

3	Synopsis:	In this course, the students will learn the concepts of object oriented programming and solving problems in object oriented programming language. The course begins with comparison of structural programming paradigm with object oriented paradigm, a brief review of control structures and data types with emphasis on structured data types and array processing. It then moves on to introduce the object-oriented programming paradigm, focusing on the definition and use of classes and objects, Inheritance, Package and Interface, Exception Handling, File I/O, GUI and Multithreading.				
4	Name(s) of Academic Staff:	Mr. Abubeker Y.				
5	Semester and Year offered:	Semester:	II	Year:	II	(Major Mandatory)
6	Credit Hour:	3 (2-0-3)				
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 do:					
	CLO1	Explain the importance of object oriented programming and its difference with structured programming.				
	CLO2	Discuss the object oriented programming concepts such as data abstraction, encapsulation, information hiding, inheritance and polymorphism.				
	CLO3	Apply the object oriented concepts to solve the real world problem using Java				
	CLO4	Design a java application to manipulate files with proper exception handling				
	CLO5	Develop GUI based java applications to solve real a world problems				

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

(CLO)	Program Learning Outcomes (PO)								Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√								√		√			√	√		√
CLO2	√								√		√		√	√			√
CLO3			√						√		√			√	√		√
CLO4		√							√		√		√				√
CLO5				√					√		√					√	√

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)
1	**Programming skills**
2	**Problem solving insight:** Students able to look and represent the real world problems on the concept object interactions.

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

	Course Content Outline		Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	**T**	**P**	**O**			
	Chapter 1 - Introduction: Programming Paradigms, History of Java, Features of Java, Java vs C++, Java Environment setup, JDK, JRC, JVM	1	3						3hrs
	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	2	6		6			2	14hrs
	Chapter 3 -Inheritance: Aggregation, Overloading and Overriding Methods, In boxing and Out boxing Supper and Final Keyword, Polymorphism, Abstract Class	3	6		6			1	13hrs
	Chapter 4 -Package and Interface: Interface, Package, Access modifiers, Encapsulation	3	3		6			1	10hrs

	Chapter 5 -Exception Handling: Types of Exception, Hierarchy of Exception Handling, Try-Catch-Final Blocks, User Defined Exceptions	4	3		6			1	10hrs
	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	4	3		6		1	1	11hrs
	Chapter 7 - GUI: Java Swing, Window Component, Event Delegation Model, Event-Driven programming and Event Handling	5	3		6			1	10hrs
	Chapter 8: Multithreading:Thread, State of a Thread, Thread API, Synchronization, Inter-Thread Communication.	5	3		6			1	10hrs
								Total	**81hrs**

	Assessment					
	Continuous Assessment		**Percentage Total-65(%)**	**F2F**	**NF2F**	**SLT**
	1	Assignments	Assignment I (10%)	2	3	5hrs

	2	Quiz	Quiz I (5%)	1		1hrs
	3	Lab Project	Group Project (10%)	4	10	14hrs
	4	Test	Mid Exam (20%)	2	4	6hrs
	5	Choose an item.				
					Total	**26hrs**
	Final Exam		**Percentage 35(%)**	**F2F**	**NF2F**	**SLT**
	Final Exam		35%	3	10	13hrs
					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	1	Software: JDK and NetBeans IDE or any Text Editor			
		2	Computer Laboratory			
13	Text book and reference:	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.			
	Web Resources		www.coursera.org https://www.javatpoint.com/java-tutorial https://www.tutorialspoint.com/java/index.htm https://docs.oracle.com/javase/tutorial/			

			https://www.guru99.com/java-tutorial.html
	Lab Software requirements		NetBeans IDE 8.2 with JDK

Adama Science and Technology University			
1	School: ***School of Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***
2	Course Category	***Major Mandatory***	
	Course Name	***Computer Architecture & Organization***	
	Course Code:	***SEng2204***	
3	Synopsis:	This course aims to provide a strong foundation for students to understand modern computer system architecture and to apply these insights and principles to future computer designs. The course is structured around the three primary building blocks of general-purpose computing systems: processors, memories, and networks. The first half of the course focuses on the fundamentals of each building block. Topics include instruction set architecture; single-cycle, FSM, and pipelined processor microarchitecture; direct mapped vs. set-associative cache memories; memory protection, translation, and virtualization; FSM and pipelined cache microarchitecture; cache optimizations; network topology and routing; buffer, channel, and router microarchitecture; and integrating processors, memories, and networks. The second half of the course delves into more advanced techniques and will enable students to understand how these three building blocks can be integrated to build a modern shared-memory multicore system. Topics include superscalar execution, out-of-order execution, register renaming,	

		memory disambiguation, branch prediction, and speculative execution; multithreaded, VLIW, and SIMD processors; non-blocking cache memories; and memory synchronization, consistency, and coherence. Students will learn how to evaluate design decisions in the context of past, current, and future application requirements and technology constraints
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: I Year: 3
6	Credit Hour:	3
7	Prerequisite/ Co-requisite:	ECE3204 (Digital Logic Design)
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	

	CLO1	Describe the basic structure and operation of a digital computer
	CLO2	Explain the basic structure of computer hardware & software
	CLO3	Explain in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
	CLO4	Identify different ways of communicating with I/O devices and standard I/O inter-faces.
	CLO5	Describe the different memory architectures and Hierarchy.

	CLO6	Describe different performance enhancement of computer architecture.
	CLO7	Write a program in assembly language and simulate the design of CPU
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods				Assessment				
										L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√									√				√	✓			✓
CLO2		√								√		√			✓	√		✓
CLO3			√							√		√		√	✓	√		✓
CLO4				√						√		√						✓
CLO5				√						√		√		√			√	✓
CLO6	√									√		√				√		✓
CLO7				√						√		√					√	✓

10	Transferable Skills
	Ability to analyze and explain different computer architectures and details of computer 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 ○ Organization and architecture	CLO1&2	√				√	√	15hrs
	1.2 Computer evolution, performance, models of computer system								
	Chapter 2: The Central Processing Unit (CPU) 2.1 Instruction Set	CLO2	√	√	√	√	√	√	15hrs
	2.2 Instruction Format and addressing mode.								
	2.3 CPU structure, RISC and CISC								
	2.4 The Control Unit (Hardwired and Micro-programmed Implementations)								
	Chapter 3: Memory Systems 3.1 Classification and hierarchy of Memory Systems	CLO5	√		√	√	√	√	15hrs
	3.2 Main Memory, Cache Memory, Secondary Memory, Other types of memory								
	3.3 Memory Management								
	Chapter 4: Input Output Systems 4.1 Input Output Devices	CLO4	√	√	√	√	√	√	15hrs
	4.2 Modes of transfer, I/O interfaces.								
	4.3 Techniques used for I/O operations: Programmed, Interrupt-driven, Direct Memory access								

	Chapter 5: Parallel Processing 5.1 Multiple Processor Organization	CLO6&7	√	√	√	√	√	√	20hrs
	5.2 Multiprogramming and Multiprocessing								
	5.3 Multithreading and Chip Multiprocessors								
	Sub Total								***80hrs***

Assessment					
Continuous Assessment		Percentage Total-50(%)	F2F	NF2F	SLT
1	Quiz	10	2Hrs		2Hrs
2	Tests	10	3Hrs	2hrs	5Hrs
3	Mid Exam	15	3Hrs	6hrs	9Hrs
4	Assignments	10	1hr	2hrs	3hrs
5	Project	15	2hrs	8hrs	10hrs
Final Exam		Percentage 60 (%)	F2F	NF2F	SLT
Final Exam		40	3hrs	8hrs	***11hrs***
				Sub Total	***40***
				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.	1	Software
		2	Computer Lab
		3	Simulation Room
13	Text book and reference:	1	*William Stalling, Computer Organization and Architecture: Designing for Performance, 9th Edition or latest, Prentice Hall, 2013*
		2	*Andrew S. Tannenbaum, Structured Computer Organization, 6th Edition, Prentice Hall, 2012*
		3	*Computer Organization and Design. The Hardware/ Software Interface, David Patterson & John Hennessy, 4th edition (revised) 2012, Morgan Kaufmann Publishers,Elsevier Inc.,*
		4	*MOOC www.coursera.org Computer organization and Architecture*

Adama Science and Technology University		
1	School: ***SoEEC***	Department: ***Computer Science and Engineering***
2	Course Category	***Major Mandatory***
	Course Name	***Fundamentals of Software Engineering***
	Course Code:	***SEng2206***
3	Synopsis:	This course deals with principles of software engineering: requirements, design and testing. Reviews the principles of object orientation: object oriented analysis using UML, Frameworks and APIs. Introduction to the client-server architecture. Analysis, design and programming of simple servers and clients. Introduction to user

		interface technology.																	
4	Name(s) of Academic Staff:																		
5	Semester and Year offered:	Semester:	I					Year:	3										
6	Credit Hour:	3																	
7	Prerequisite/ Co-requisite: (if any)	Explain well-known software development process models.																	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:																		
	CLO1	Discover what software are, software processes and the history of the term, “software engineering,” by explaining its current meaning and importance.																	
	CLO2	Explain well-known Software development process models.																	
	CLO3	Discuss about the software requirements engineering processes, methods, tools and techniques.																	
	CLO4	Demonstrate the role of project manager in preparing project plan, schedule, and manages risks and software projects.																	
	CLO5	Classify object oriented software design, methods, quality attributes, architectural design decisions and architectural views.																	
	CLO 6	Evaluate standard coding practice and testing models in performing unit, integration, systems and acceptance testing.																	
	CLO 7	Discover what software maintenance is with respect to change and maintenance, factors of maintenance cost, type of maintenance and maintenance model.																	
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																		
	Course Learning Outcomes	Program Learning Outcomes (PO)																	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	Teaching Methods	Assessment							
												Test	Quiz	Assignment	Project	Final Exam			

											L	T	P	O					
	CLO1	√							√		√			√		√	√		√
	CLO2	√									√			√			√		√
	CLO3		√								√					√		√	√
	CLO4					√			√		√				√		√		√
	CLO5			√							√			√	√			√	√
	CLO 6	√									√			√		√	√		√
	CLO 7					√	√				√				√				√
	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	Teaching and Learning Activities							Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	IndependentLearning (NF2F)		
			L	T	P	O				
	Chapter 1: **History and overview**	1								6hrs

	1.1Introduction								
	1.2 A shortened history of software engineering								
	Chapter 2: **Software processes** 2.1 Software Process	1							7hrs
	2.2 Software life cycle and process models								
	2.3 Process assessment models								
	2.4 Software process metrics								
	Chapter 3: **Requirement Engineering** 3.1 Software Requirements	2							7hrs
	3.2 Requirement Engineering Process								
	3.3 System Models								
	Chapter 4: **Software Project** m**anagement** 4.1 Responsibility of Software	4							8hrs

	Project Managers								
	4.2 Project Planning								
	4.3 The organization of SPMP document								
	4.4 Project Size Estimation Metrics								
	Chapter 5: **Software Design and Architecture Concepts** 5.1 Software Design	5							8hrs
	5.2 Software Architectures								
	5.3 Function Oriented Design								
	5.4 Detailed Design								
	Chapter 6: **Coding** 6.1 Programming Principles and guidelines	6							6hrs
	6.2 Coding process								
	6.3 Validation and Verification Metrics								
	Chapter 7: **Software Testing**	6							6hrs

	7.1 Testing Fundamentals								
	7.2. Black-Box and White-Box testing								
	7.3 Testing and Debugging								
	Chapter 8: **Software maintenance** 8.1 Maintenance fundamentals	7							7hrs
	8.2. Cost of maintenance								
	8.3 Types of maintenance								
	8.4 Maintenance process								
	8.4. Maintenance models								
	Total								55hrs

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	2hrs	5hrs	7hrs
2	Assignments	Assignment I (10%)	2hrs	5hrs	7hrs
3	Project	15%	2hrs	10hrs	12hrs
4	Others	Mid Exam	2hrs	10hrs	12hrs

			(25%)			
	5	Choose an item.				
					Total	38hrs
	Final Exam		Percentage %	F2F	NF2F	SLT
	Final Exam		40%	3hrs	12hrs	15hrs
					Grand Total SLT	108hrs
	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	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	Ian Sommerville (2011), Software Engineering 8th or later edition. Pearson Education Ltd
		2	Pressman, Roger (2001), Software Engineering: A Practitioner's Approach. Fifth Edition.McGraw-Hill
		3	Pankaj Jalote (2005), An Integrated Approach to Software Engineering, 3rd Edition, Springer.

Adama Science and Technology University							
1	School: ***Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***			
2	Course Category	***Major mandatory***					
	Course Name	***Database Systems***					
	Course Code:	***SEng2208***					
3	Synopsis:	A database system is a collection of data with its managements system. So, DB systems discusses an issues related with a data such as, approaches of compiling data/information, manipulating data, keeping data safely, accessing data, concurrent process and etc.					
4	Name(s) of Academic Staff:	TBA					
5	Semester and Year offered:	Semester:	II	Year:	2		
6	Credit Hour:	4					
7	Prerequisite/ Co-requisite: (if any)						
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Describe basic concepts of database systems, models such as entity relationship diagrams (ERD) and relational database.					
	CLO2	Describe the major components of a modern database system and the functionality provide by language such as SQL.					
	CLO3	Explain and discuss issues related with data redundancy in a database, normalization theory for database design and apply normal forms.					
	CLO4	Discuss transaction management and concurrency control of data processing and how to manage them by different techniques,					

		and database recovery.
	CLO5	Explain and evaluate query optimization, database security and apply security preventing techniques to a database.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					Teaching Methods				Assessment				
													L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√												√				√	√	√	√	✓
CLO2	√												√		√			✓	√	√	✓
CLO3				√									√		√		√	✓	√	√	✓
CLO4			√										√		√					√	✓
CLO5						√							√		√						✓

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)

Students will acquire the following skills in the study of this course:

- Developing a database for any organizations using a reliable approaches of compiling data.
- Managing and controlling a database of any organizations including its data security.
- Manipulating big data and etc.

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: **Introduction to Database Management System** 1.1 Database definition	CLO1	√			√	√	√	16hrs
	1.2 Database management System/DBMS and its components								
	1.3 Database Development Life Cycle (DDLC)								
	1.4 Roles in Database Design and Use								
	1.5 Database System Architecture								
	Chapter 2:**Data modeling: - Using Entity Relationship Model** 2.1 Data modeling	CLO1, CLO2							16hrs
	2.2 Design Processing								
	2.3 Conceptual models								
	Chapter 3:**Relational database design** 3.1 Mapping conceptual schema to	CLO2, CLO3							16hrs

	a relational schema								
	3.2 Integrity constraints								
	3.3 Relational algebra and relational calculus								
	3.4 Functional dependency								
	3.5 Normalization and normal forms								
	Chapter 4:**Transaction Management** 4.1Transaction processing	CLO4	√		√	√	√	√	20hrs
	4.2Scheduling								
	4.3Recoverability								
	4.4 Serializability								
	Chapter 5:**Concurrency Control Techniques** 5.1Time stamping	CLO4	√		√		√	√	26hrs
	5.2Locking								
	5.3 Optimistic concurrency control								
	5.4 Granularity								
	Chapter 6:**Query Processing and**	CLO5	√		√		√	√	30hrs

	Optimization 6.1Query Processing and Optimization: Why?								
	6.2 Steps of Processing								
	6.3 Methods of Optimization								
	Chapter 7**: Database Recovery** 7.1 Recovery Concepts	CLO4	√		√		√	√	8hrs
	7.2 Recovery techniques								
	Chapter 8: **Database Security** 8.1 Introduction to DB security	CLO5	√				√	√	8hrs
	8.2 Discretionary Access Control								
	8.3 Mandatory Access Control								
	8.4 Role-Based Access Control								
	8.5 Statistical Database Security								
	Total		42hrs	0	42hrs	0	11hrs	37hrs	140hrs

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Quiz	(10%)	2		2hr
	2	Assignment	(10%)		5hrs	5hrs
	3	Project	15%		5hrs	5hrs
	4	Mid Exam	(25%)	2hrs	0	2hrs

					Total	14hrs
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3hrs	3	6hrs
					Grand Total SLT	160hrs
	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	Software required such as SQL, MySQL to write query languages on it or any other software used to execute queries of the database language.			
		2	Computer laboratory should be required for practice, project and may be for assignment.			
13	Text book and reference:	1	Abraham Silberschatz et. al, Database System Concepts, 6th edition			
		2	Elmasri navathe, Fundamentals of database systems, 6th edition.			
		3	Ramakrishnan, Raghu, and Johannes Gehrke. *Database Management Systems*. 3rd ed. McGraw-Hill			

Adama Science and Technology University			
1	School: ***Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***
2	Course Category	***Major Elective***	
	Course Name	***Software Requirement Engineering***	
	Course Code:	***SEng3201***	

3	Synopsis:	The course will discuss concepts for systematically establishing, defining and managing the requirements for a large, complex, changing and software-intensive systems, from technical, organizational and management perspectives. This course introduces students to the process of requirements engineering and helps them understand important issues in requirements engineering. It will also help them to learn and apply the RE concepts for elicitation, specification, modeling and analysis of software requirements.					
4	Name(s) of Academic Staff:						
5	Semester and Year offered:	Semester:		Year:			
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	Fundamentals of Software Engineering					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Develop effective functional and non-functional requirements that are complete, concise, correct, consistent, testable and unambiguous.					
	CLO2	Understand and Explain the concepts of software requirements elicitation, process ,modelling, validation and verification;					
	CLO3	Select the appropriate requirements elicitation and analysis techniques to identify requirements.					
	CLO4	Apply proper requirements management and validation technique and their quality concerns.					
	CLO5	Generate and maintain a software requirements specification document					

	CLO6	Understanding about tools and techniques used in requirements engineering.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

	(CLO)	Program Learning Outcomes (PO)									Teaching Methods				Assessment					
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9					Test	Quiz	Mid Exam	Assignment	Project	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 (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			Total (SLT)	
			Guided learning (F2F)	Guided Learning (NF2F)	Independent Learnin		

								g (NF 2F)		
			L	T	P	O				
	Chapter 1: Software Requirements Fundamentals 1.1 Definition of software Requirement 1.2 Product and Process Requirement 1.3 Functional Requirement and Non-Functional Requirement 1.4 Emergent Properties 1.5 Quantifiable Requirements 1.6 System Requirements and Software requirements	1	4					4	8hrs	

	Chapter 2:**Requirement Process** 2.1. Process Models 2.2. Process Actors 2.3. Process Support and Management 2.4. Process Quality and Improvement	2	4					4	8hrs	
	Chapter 3: Requirements Elicitation 3.1. Requirements Sources 3.2. Elicitation Techniques	2	4					6	10hrs	
	Chapter 4: Requirements Analysis 4.1. Requirements Classification 4.2. Conceptual Modeling 4.3. Architectural Design and Requirements Allocation 4.4. Requirements Negotiation 4.5. Formal Analysis	3	4					6	10hrs	

	Chapter 5: Requirements Specification 5.1. System Definition Document 5.2. System Requirements Specification 5.3. Software Requirements Specification	5	4					5	9hrs	
	Chapter 6: Requirements Validation 6.1. Requirements Reviews 6.2. Prototyping 6.3. Model Validation 6.4. Acceptance Tests	2	4					5	9hrs	
	Chapter 7: Practical Considerations 7.1. Iterative Nature of the Requirements Process 7.2. Change Management 7.3. Requirements Attributes 7.4. Requirements Tracing 7.5. Measuring Requirements	4	4					6	10hrs	

	Chapter 8: Software Requirements Tools 8.1 Demonstration on current software requirements Tools	6			6			4	10	
	Total		28		6			39	73	

Assessment						
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT	
1	Assignments	Assignment I (10%)		5	5	
2	Assignments	Assignment II (10%)		7	7	
3	Project	15%		12	12	
4	Others	Mid Exam (25%)	2	8	10	
5	Choose an item.					
				Total	34	
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT	
Final Exam		40%		13	13	

			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 and reference:	1	*Software Requirements* (*3rd Edition*) (Developer Best Practices) by Wiegers, Karl, Beatty, Joy. *Microsoft Press*, 2013.	
		2	Dick, Jeremy & Hull, Elizabeth & Jackson, Ken. (2017). Requirements Engineering.	

Adama Science and Technology University		
1	School: ***SoEEC***	Department: ***Computer Science And Engineering***
2	Course Category	***Major Mandatory***
	Course Name	***Engineering web based systems***
	Course Code:	***SEng3202***

3	Synopsis:	This course introduces to the discipline of web Engineering including the principles, methods and techniques used in web-based system development so as to produce high-quality software applications for the distributed, client-server context of the Web. Emphasis is on architectural designs, methods, models, language and data access methods that are common in Web-based systems. In addition the course introduces web service concepts				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	2	Elective II
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	SEng1102				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:
CLO1	Discuss web based systems concepts and information architectures
CLO2	Explain web design and modeling concepts
CLO3	Implement client side scripting
CLO4	Identify the security risk of a Web application.
CLO5	Apply the web engineering methodologies for Web application development
CLO6	Develop a web application using server side programming languages and components
CLO7	Discuss current trends in web engineering

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

Course	Program Learning Outcomes (PO)													
	PO	PO	PO	PO	PO	PO	PO	PO						Assessment

														Teaching Methods				Assignment	Quiz	Lab Asst	Project	Mid
														L	T	P	O					
	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	Develop Analytical skills
	2	Inculcate Group/team working& goodWritten communication
	3…etc.	Project management and Oral communication

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			
	*****syllabus introduction**** **Chapter 1: Introduction to Internet & WorldWideWeb:** –HistoryoftheInternet&World-WideWeb –Definitions –WebStandards –CategoriesofWebApplications – Characteristics of Web Applications. – Tools and Web Programming Languages and technologies **** fundamentals of HypertextMarkUpLanguage (HTML)**	1	4		6				10
	Chapter 2: Web-Based Information SystemArchitecture: –Fundamentals –CategorizingArchitectures –ComponentsofaGenericWeb ApplicationArchitecture –LayeredArchitectures ****Introduction to cascadingStyleSheets(CSS)**	1	2		6				8
	Chapter 3: Web application Requirements Engineering:	1, 3	4		6				10

	- overview −WhereDoRequirementsCome From? Revision on Requirements EngineeringActivities − Software Requirements with Relevance to the Web − Principles for RE of Web Applications − AdaptingREMethodstoWeb ApplicationDevelopment. ****Introduction to JavaScript**								
	Chapter 4: Web application design and Modeling concepts: **Web application design overview** - Design concepts (principles and processes) - Workflow design - Data design - Presentation design - Architecture Design **Web Modeling Fundamentals** −ModelingRequirements −ContentModeling −HypertextModeling −PresentationModeling **Comparison of Engineering methods for developing web applications** -web modeling language, UML-based web engineering, RUX Method, Object Oriented Hypermedia Design Method, Object Oriented Web Solutions,	2, 5	4		6				10

	Semantic Hypermedia Design Method, Hera Methodology, Web Requirements Engineering, Interaction Flow Modeling Language								
	Chapter 5: Server side programming and web application frameworks *****-Basics of PHPProgramming *-Cookies, sessions and authentication *-file and directories *-Database programming	6	6		9				15
	Chapter 6: Introduction to service oriented architecture -service principles -web systems architecture -Web Services (WS*) and Representational State Transfer (REST) architecture -XML/JSON -Introduction to micro services	1	2		3				8
	Chapter 6: System security for web-based software systems -Web Application Security Basics -common vulnerabilities	4	2		3				5
	Chapter 7: Current trends in web Engineering		2		0				2
	StudentProject Presentation		2		3				5
	Total		2 8	0	42				70hrs
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment (5%)	30 min	2:30	3 hrs
	2	Assignments	Lab assignment (10%)	30 min	5:30	6 hrs
	3	Quize	Quiz- 10%	1:00 hr	5	6 hrs
	4	Lab-report/Project	Project- Report -15%		√	10 hrs
	5	Others	Mid Exam - 20%	2:30	7:30	10 hrs
					Total	
	Final Exam		Percentage (%)	F2F	NF2F	SLT
	Final Exam		40%	3	12	15 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,	1	Software			
		2	Computer Lab			
		3	Choose an item.			
		4	Choose an item.			

	computer lab, simulation room …etc.)	5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	[1] Steve Prettyman. (2012) Learn PHP 7: Object-Oriented Modular Programming using HTML5, CSS3, JavaScript, XML, JSON, and MySQL. Stone Mountain, Georgia USA. [2] Brandon D. M. (2008) *Software Engineering for modern webapplications: methodologiesandtechnologies*,FirstEdition,IGIGlobal [3] DeitelP.J.,DeitelH.M.andDeitelA.(2012)*InternetandWorldWideWeb:How toProgram*,FifthEdition,PearsonPrenticeHall. [4] Sven C., Florian D., Peter D., Maristella M. (2009) Engineering Web Applications. Springer-Verlag Berlin Heidelberg. [5] Andrew Hoffman. 2020. Web Application Security.O'Reilly Media, Inc. USA.	

Adama Science and Technology University			
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science and Engineering***	
2	Course Category	***Core Module***	
	Course Name	***Software Architecture and Design***	
	Course Code:	***SEng3204***	

3	Synopsis:	In this course, An in-depth look at the software design. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures and technologies. Design of a new systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software.						
4	Name(s) of Academic Staff:							
5	Semester and Year offered:	Semester:	II	Year:	3			
6	Credit Hour:	3						
7	Prerequisite/ Co-requisite: (if any)	Software Requirements engineering (SEng3201)						
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:							
	CLO 1	Discuss basic design concepts and principles in software development						

	CLO 2	Applying a variety of design concepts and architectural styles in designing a wide variety of software solutions.	
	CLO 3	Using the sound quality metrics as objectives for designs, and then measuring and assessing designs to ensure the objectives have been meet.	
	CLO 4	Differentiate design quality attributes during software development	
	CLO 5	Apply system decomposition and sub system integration techniques for large scale software system	
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:		

Course Learning Outcomes	Program Learning Outcomes (PO)																	
													Teaching Methods	Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09					Test	Quiz	Assignment	Project	Lab-report

	(C LO)													L	T	P	O					
	CLO 1									√				√				√				
	CLO 2									√				√					√			
	CLO 3								√					√				√				
	CLO 4								√					√						√		
	CLO 5								√											√	√	

	Indicate the relevance 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.									
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 1: Introduction 1.1 Architectural Thinking 1.2 Modularity 1.3 Architecture Characteristics Defined 1.4 Identifying Architectural Characteristics 1.5 Measuring and Governing Architecture Characteristics 1.6 Scope of Architecture	CLO1	6					7	10hrs	

	Characteristics 1.7 key issue in Software Design 1.7.1 Concurrency 1.7.2 Control and Handling of Events 1.7.3. Data Persistence 1.7.4 Distribution of Components 1.7.5 Error and Exception Handling and Fault Tolerance 1.7.6 Interaction and Presentation 1.7.7 Security									
	Chapter 2: Architecture Styles 2.1 Layered Architecture Style 2.2 Pipeline Architecture Style 2.3 Microkernel Architecture Style 2.4 Client/Server Architecture Style 2.5 Event-Driven Architecture Style 2.6 Space-Based Architecture Style	CLO2	4					5	7hrs	

	2.7 Orchestration-Driven Service-Oriented Architecture 2.8 Micro services Architecture 2.9 architecture in the Edge/ cloud 2.10 Choosing the Appropriate Architecture Style									
	Chapter 3: Subsystem Design 3.1 Definition 3.2 Modeling Subsystems, Interfaces, and Layers 3.2.1 Subsystem Interface Dependency Viewpoint 3.2.1.1 External Interface Design 3.2.1.2 Internal Interface Design 3.2.1.3 Graphical User Interface Design 3.2.2 Enhancing the Subsystem Dependency Views with layers	CLO5	8					8	10hrs	

	3.2.3 Top-level Dependencies 3.2.4 The Layered Subsystem Viewpoint 3.3 Mapping Subsystems and Layers to Implementation 3.3.1 Subsystems, layers, and build trees 3.3.2 Subsystems and components									
	Chapter 4: Transaction and Data Design 4.1 Logical Data Architecture 4.1.1 Logical data model stability 4.1.2 Effects of the stable logical data model 4.2 Logical Data Viewpoint 4.2.1 Logical Data View example 4.2.2 Logical Data View for	CLO3	5					8	8hrs	

	messaging 4.3 Data Model Design – Other Considerations 4.3.1 Data models and layers 4.3.2 Data models and reflection 4.3.3 Mapping objects to relational database 4.4 Transaction Design 4.4.1 Transaction concepts 4.4.2 Modeling transaction dynamics 4.4.3 Transactions and interface design									
	Chapter 5: Software Architecture Process 5.1 Process Outline 5.1.1 Determine Architectural Requirements	CLO2	2					6		

	5.1.2 Identifying Architecture Requirements 5.1.3 Prioritizing Architecture Requirements 5.2 Architecture Design 5.2.1 Choosing the Architecture Framework 5.2.2 Allocate Components 5.3 Validation 5.3.1 Using Scenarios 5.3.2 Prototyping 5.4 Design Quality Attribute 5.4.1 availability 5.4.2 Interoperability 5..4.3 Performance 5.4.4 Security									

	5.4.5 Testability									
	Chapter 6 Introduction to Middleware Architectures and Technologies 6.1 Middleware Technology Classification 6.2 Distributed Objects 6.3 Message-Oriented Middleware	CLO5	5					3		
	Total		42					38	79hrs	

Assessment						
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT	
1	Assignments	Assignment I & II (10%)	1	6	5	
2	Test	Test I & II (20%)	2	8	10	
3	Project	20%	2	18	20	

	4	Quiz	(10%)	1		1
	5	Choose an item.				
					Total	36hrs
	Final Exam		Percentage 50 (%)	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 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.
1	Text book and	1	Jeff Garland , Richard Anthony ,Large-Scale Software Architecturer,2003

3	reference: (note: ensure the latest edition /publication)		Len Bass Paul Clements Rick Kazman,Software Architecture in Practice,2013	
			Ian Gorton,Essential Software Architecture,2011	

ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

Software Engineering Program

1	School: ***School of Electrical Engineering and Computing***			Department: ***Computer science and Engineering***			
2	Course Category						
	Course Name	***Data Communication and Computer Networks***					
	Course Code:	***SEng3205***					
3	Synopsis:	This course deals with basic concepts, principles and applications of data communication system. ISO OSI reference model for open system interconnection is used as the basis to discuss the functions and protocols of layered network structures. The course also introduces the evolution trends of networking technologies, various types of networks from LAN to WAN and internetworking architectures. Transmission Control Protocol / Internet Protocol (TCP/IP) will be discussed in detail.					
4	Name(s)of Academic Staff:						
5	Semester and Year offered:	Semester:	II	Year:	3		
6	Credit Hour:	4					
7	Prerequisite	None					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Discover basic concepts, principles and applications of data communication and computer networking in order to understand the working principles of computer networking.					

	CLO2	Discuss constraints of the development of computer networks, such as transmission media, network security, and network management in order to select appropriate network topology.
	CLO3	Describe the evolving trends of networking technologies, topologies and application in LAN to WAN.
	CLO4	Apply protocols in layering architecture (OSI and TCP/IP)
	CLO5	Perform configuration on networking devices using simulation software as well as real hardware.
	CLO6	Design small and medium size local area network(LAN)
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

(CLO)	Program Learning Outcomes (PO)								Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	L	T	P	O	Test	Mid	Assignment	Project & lab report	Final
CLO1	• √													√		√	√
CLO2	• √													√		√	
CLO3	• √													√	√	√	
CLO4	•	√													√	√	
CLO5				√											√	√	

CLO6				√													

L = Lecture, T = Tutorial, P = Practical, O = Others(Observation of ASTU's ICT Network Infrastructure), F2F = Face to Face, NF2F = Non Face to Face

10	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Research and analytical skills
	2	Problem solving skill
	3…etc.	Communication 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:Introduction to data communication and computer networks **1.7.** Introduction to data communication basics **1.8.** Multiplexing	1	9		9		4	4	26Hrs

	1.9. Introduction to computer networks 1.9.1. Types of networks, topology and its applications **1.10.** Transmission media **1.11.** Introduction to OSI and TCP/IP models									
	Chapter 2: Data link layer 2.1.Responsibilities of data link layer 2.2 frame structure and framing techniques 2.3.Ethernet technologies 2.4 Layer two devices 2.4.1 Switches	5	6		6		2	2	16Hrs	
	Chapter 3. Network layer and routing 3.1 Responsibilities of network layer 3.2 Routing basics 3.3 IP and IP addressing 3.3.1 class full addressing 3.3.2 classless addressing 3.4 Sub netting 3.6 Address mapping	3	9		9		3	3	24Hrs	

	Chapter 4. Transport and application layer 4.1 Introduction to transport layer and its responsibilities 4.1.1 Elements of transport protocol 4.1.2 Transport layer protocol 4.2 Application layer and its responsibilities 4.2.1 application layer protocols and their functionalities 4.3 Network management	4	9		9		4	2	24Hrs	
	Chapter 5. Introduction to WAN and LAN Technologies 5.1 LAN technologies 5.2 WAN technologies	6	6		6	4	2	2	20hrs	
	Chapter 6. Computer Network Security Basics	2	3		3		2	2	10Hrs	
	Total		42		36	4	38		120	

Assessment				
Continuous Assessment	Percentage Total-60(%)	F2F	NF2F	SLT

	1	Quiz	(10%)	1		1	
	2	Assignments	Assignment (10%)		9	9	
	3	Lab Project	15%	4	20	24	
	4	Others	Mid Exam (25%)	2		2	
					Total	36	
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT	
	Final Exam		40%	3		4	
					Grand Total SLT	160	
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face						

12	Simulation software and tools required	1	Cisco packet tracer		
		2	Network cable(bar copper),RJ45, tester, cutter and RJ45 crimping tool		
		3	Computer, printer, and tip link		
13	Text book and reference:	1	Behrouz A. Forouzan, et al, Data Communications and Networking, 4th Edition, Mc Graw Hill: Higher Education, 2007		
		2	Data and Computer Communications, 8th ed.,William Stallings		
		3	Computer Networking. Kurose & Ross. Addison Wesley		
		4	Fred Halshall "Data Communication, Computer Networks & Open systems" Publication Pearson Education		

AdamaScience and Technology University						
1	School: ***Electrical Engineering and Computing***			Department: ***Software Engineering***		
2	Course Category	***Core Module***				
	Course Name	***Mobile application Design and Development***				
	Course Code:	***SEng3206***				
3	Synopsis:	This course introduces students to programming technologies, design and development related to mobile applications. Topics include accessing device capabilities, industry standards, operating systems, and programming for mobile applications using an OS Software Development Kit (SDK). Upon completion, students should be able to create basic applications for mobile devices.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	3	Major Mandatory
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					

	CLO1	Write a mobile applications for the Android operating system that use basic and advanced phone features
	CLO2	Understand the knowledge concerning mobile operating systems and their architecture
	CLO3	Students understand setup a mobile device and application runtime environment
	CLO4	Deploy applications to the Android marketplace for distribution.
	CLO5	perform a simulation of the operation using the emulators of mobile devices and physical mobile devices
	CLO6	Identify various concepts of mobile programming that make it unique from programming forother platforms,
	CLO7	Implement mobile application design and development concepts in a given problem domains
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	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				√						√		√			√			
	CLO 7	√									√		√			√	√		
	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)	

1	Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning Total (F2F)	Independent Learning (NF2F)	
			L	T	P	O			
	Chapter 1: Introduction 1.1 Why Mobile Apps? 1.2 Mobile App Design Issues and Considerations 1.2.1 Operating system 1.2.2 Screen Size and Orientation 1.2.3 Connectivity 1.2.4 Battery 1.2.5 Storage 1.2.6 Hardware 1.2.7 Business 1.3 Modern mobile operating systems and their architecture 1.4 Current mobile application development framework and tools 1.5 Characteristics of Mobile Applications	CLO1	6					2	8

	Chapter 2: Fundamental of Android: 2.1 The Android Platform 2.2 Understanding Anatomy of Android Application, 2.3 Android Manifest file. 2.4 Android Application Design Essentials : Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, and its common settings, Using Intent Filter, Permissions.	CLO2	4		9				13
	Chapter-3 Mobile User Interface Design 3.1 Effective use of screen real estate 3.2 understanding mobile application users	CLO7	4		6				10

	3.3 understanding mobile information design 3.4 understanding mobile platforms 3.5 Android User Interface Design Essentials: 3.5.1 User Interface Screen elements 3.5.2 Designing User Interfaces with Layouts 3.5.3 Drawing and Working with Animation								
	Chapter -3 Data Storage and Retrieval 3.1 Introduction , characteristics of distributed mobile database systems 3.2 Different types of data storages in mobile devices. 3.3 Query processing in mobile databases, query decomposition, data localization, optimization	CLO3, CLO4, CLO7	4		6				10

	3.4 Architecture of databases for mobile systems 3.5 data API Synchronization and Replication of Mobile Data 3.6 Android Storing and Retrieving Data 3.6.1 Shared preference 3.6.2 Working with files 3.6.3 Working with SQL light								
	Chapter-4 Using Common Android APIs: Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, accessing hardware's and sensors ,Deploying Android Application to the World	CLO9	4		6				10
	Chapter 5- Communications Via Network and the Web 3.1 Type of Communications	CLO6	4		6			1	11

	Model 3.2 Introduction to web service 3.3 HTTP Client ,XML and JSON 3.4 Android Networking and Web								
	Chapter 6- Maps and Location in Android 6.1 Mobility and Location Based Services 6.1 How to work with Google Map 6.1 How to work with GPS	CLO4	7		6				13
	Chapter 7-Testing and publishing Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	CLO6	6		2			0	8

Total		42		40			1	83hrs

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I &II (20%)	2	6:30	8:30
2	Quiz/Test	Quiz I & II (25%)	2	2	4
3	Project	Course Project (15%)	2	19	21
5	Choose an item.				
				Total	36:30hrs

Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
Final Exam	40%	2:30	11	13:30hrs
			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	
		2	
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Jeff McWherter and Scott Gowell,professional Mobile Application Development ,2012
		2	akob Iversen Michael Eierman,Learning Mobile App Development,2013
		3	T1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
		4	

Adama Science and Technology University			
1	School: ***School of Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***
2	Course Category	***Core Module***	

	Course Name	***Operating Systems***				
	Course Code:	***SEng3207***				
3	Synopsis:	This course examines the important problems in operating system design and implementation. The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for sharing resources (e.g., disks, networks, and processors), providing common services needed by many different programs (e.g., file service, the ability to start or stop processes, and access to the printer), and protecting individual programs from interfering with one another. The course will start with a brief historical perspective of the evolution of operating systems over the last fifty years and then cover the major components of most operating systems. This discussion will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems; and on operating system support for distributed systems.				
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)	Computer Organization and Architecture				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Describe the fundamental concepts of a computer operating systems.
	CLO2	Discuss the procedures for scheduling, deadlocks, memory management, process synchronization, system calls, and file systems.
	CLO3	Implement fundamental OS structures, including Processes, system calls, scheduling, virtual memory, and file systems
	CLO4	Discuss how the operating systems manages the storage and retrieval of data in storage devices as well as current technologies of mass storage structures.
	CLO5	Write and debug concurrent programs.

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					Teaching Methods				Assessment				
													L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√												√					√	√		√
CLO2		√											√		√		√	√			√
CLO3				√									√		√			√	√		√
CLO4		√											√		√		√				√
CLO5				√									√		√					√	√

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	Students can able to assemble the systems (CPU) and can perform the system services							
	2								
	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: Introduction to Operating System and its Structures 3.1. What Operating Systems Do 3.2. Computing Environments 3.3. Operating-System Operations 3.4. Special-Purpose Systems 3.5. Operating-System Structures								10hrs
	Chapter 2: **Process Management** 2.1 processes 2 Process Concept 3 Process Scheduling 4 Operations on Processes 5 Inter-process Communication 2.2 Threads 6 Multithreading Models 7 Thread Libraries 8 Threading Issues 2.3 CPU Scheduling 9 Basic Concepts 10 Scheduling Criteria								20 hrs

	11 Scheduling Algorithms 12 Multiple-Processor Scheduling 13 Algorithm Evaluation 2.4 Process Synchronization 10. Background of Process Synchronization 11. The Critical-Section Problem 12. Semaphores 13. Classic Problems of Synchronization 14. Monitors 2.5 Deadlocks 15. System Model 16. Deadlock Characterization 17. Methods for Handling Deadlocks 18. Deadlock Prevention 19. Deadlock Avoidance 20. Deadlock Detection 21. Recovery from Deadlock								
	Chapter 3: **Memory Management** 3.1 Main Memory 22. Swapping 23. Contiguous Memory Allocation 24. Paging Segmentation 3.2 Virtual Memory 25. Demand Paging 26. Page Replacement 27. Allocation of Frames 28. Thrashing								20 hrs
	Chapter 4: Storage Management 4.1 File System Interface 29. File Concept								15 hrs

	30. Access Methods 31. Directory Structure 32. File-System Mounting 33. File Sharing 4.2 Mass Storage Structure 34. Disk Structure 35. Disk Attachment 36. Disk Management 37. RAID Structure 38. Tertiary-Storage Structure								
	Chapter 5: I/O Systems 5.1 I/O Hardware 5.2 device Controller 5.3 Memory Mapped I/O 5.6 Principles of I/O Software								15 hrs
	Chapter 6: Protection and Security 39. Protection 40. Security								10 hrs
	Total								90 hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (5%)	1	4	5hrs
2	Assignments	Assignment II Lab (10%)	1	4	5hrs
3	Project	Mini Project (10%)	2	8	10hrs
4	Others	Mid Exam (25%)	3	10	13hrs
5	Quize	Quiz (10%)	2		2

	Total					35
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	3hrs	12hrs	15hrs
	Grand Total SLT					140
	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.			
		5	Choose an item.			
13	Text book and reference: (note: ensure the latest edition /publication)	1	Milenkovie M., "Operating System: Concept & Design", McGraw Hill.			
		2	Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.			
		3	Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley			
		4	Dhamdhere: Operating System TMH			
		5	Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.			

Adama Science and Technology University		
1	School: ***Electrical Engineering and Computing***	Department: ***CSE***
2	Course Category	***Core Module***
	Course Name	***Programming Under Unix***
	Course Code:	***SEng3208***
3	Synopsis:	The course introduces the use of the UNIX/Linux operating system and its utilities for program development, maintenance, and debugging. It utilizes advanced programming techniques utilizing procedural and object oriented programming. Topics to be covered include basic operating system concepts, effective command line usage, shell programming, C and python language, programming development tools, system programming, network programming (client-server model and sockets). Design and implementation of a comprehensive programming project is required.
4	Name(s) of Academic	

	Staff:					
5	Semester and Year offered:	Semester:	II	Year:	4	
6	Credit Hour:	3				
7	Prerequisite / Co-requisite: (if any)	SEng2202				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Use Linux operating system and programming environment (editor, compiler and linker) interactively				
	CLO2	Express algorithmic solutions using shell scripting (utilities) and GNU programming				
	CLO3	Practice input/output of binary files and Linux processes (creation and control)				
	CLO4	Practice on C and python programming for linux				
	CLO5	Examine the Linux file system				

	CLO6	Practice on system, network and socket programming
	CLO7	Use version control system
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)										Teaching Methods	Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10		Test	Quiz	Assignment	Project	Lab-report

												L	T	P						
	CLO1								√			√		√						
	CLO2	√										√		√						
	CLO3								√			√		√			√	√		
	CLO4								√			√		√						√
	CLO5								√			√		√		√				
	CLO6								√			√		√			√			
	CLO67								√			√		√				√	√	√
	Indicate the relevance 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	Ability to utilize command line tools
	2	Ability to program under Linux environment
	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 (NF	
			L	T	P	O			
	Syllabus & Course Introduction Chapter 1: Introduction to UNIX;	1	2		3		5	2	7

	introduction, history ● command line interface(CLI), shells, bash, C shell; distributions and application software; file system structure, pathnames, file permissions								
	Chapter 2: ● Unix/ Linux Commands ● File Systems ● Shell ● Editors ● Makefile ● shell (CLI) usage ● basic commands and utilities (cd, mkdir, rm, cp, cat, etc.); piping, redirection, filters (grep, sed etc.); command line editing, etc; shell startup files, aliases	1	4		6		10	2	1 2
	Chapter 3: ● bash ● Shell Script ● Programming with bash: variables, parameters; metacharacters, shell expansions; control constructs	2	4		3		7	2	9
	Chapter 4: ● GNU programming and development tools: gcc, make,	2	4		3		7	2	9

	gdb, etc. editors, IDEs, libraries								
	Chapter 5: ● MySQL, sqlite programming with C ● Python programming, Python (OpenCV),	4	2		3		5	2	7
	Chapter 6: ● System programming: files and I/O (open, close, read, write, dup, etc.); directories (opendir, readdir, etc.); processes (fork, exec, etc.); signals; pipes and IPC (pipo, kfifo, etc.) and IO, and API	3,5	4		6		10	2	1 2
	Chapter 7: ● Process, Shell Signal ● Threads ● Interprocess Communication (IPC)	3	2		3		5	2	7
	Chapter 8: ● Socket Programming Socket Programming - Concurrent Server	6	2		6		8	2	1 0
	Chapter 9: ● Network programming: IP	6	2		6		8	2	1

basics; TCP, UDP client-server model; sockets system calls								0
Chapter 10: ● VCS (Git, Github, Gitlab)	7	2		3		5	----	5
Total		28		4 2		70	8 8	

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF 2F	SL T
1	Tests	Test (10%)	1:00	3	4
2	Assignments 1	Assignment I (5%)	30 minutes	3	3:3 0
	Assignments 2	Assignment II (5%)	30 minutes	3	3:3 0
3	Quiz	Quiz (10%)	1:00	--	1:0 0
4	Mid	Mid Exam (20%)	2:30	3:3 0	6:0 0
5	Project	Project(15%)	30	8	8:3

				minutes		0
					Total	26:30
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3:00	5	5:30
					Grand Total SLT	32 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	Network connected computer Lab			
		2	Software			
		3	Choose an item.			
		4	Choose an item.			
		5	Choose an item.			

13	Text book and reference: (note: ensure the latest edition /publication)	1	A Practical Guide to Linux® Commands, Editors, and Shell Programming, 3ed. Mark G. Sobell. Prentice Hall. © 2012. ISBN-10: 0-13-308504-X. ISBN-13: 9780133085044
		2	Advanced Programming in the UNIX® Environment, 3e. W. Richard Stevens and Stephen A. Rago. Addison-Wesley. © 2013. ISBN-10: 0-321-63773-9. ISBN-13: 9780321637734
Adama Science and Technology University			

1	School: ***School of Electrical Engineering and Computing***	Department: ***Computer Science and Engineering***

2	Course Category	***Core Module***				
	Course Name	***Advanced Programming***				
	Course Code:	***SEng3209***				
3	Synopsis:	This intensive hands-on course explores advanced Java language features and packages. Students will be able to take the content learned and immediately apply it to the problems encountered on the job. The course emphasis on Collections, Database Programming using JDBC, Object Serialization, Reflection and JAR files creation, Distributed Programming using Remote Method Invocation, and Server-side Web programming using Servlets and JSP.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:		Year:		
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Object Oriented Programming DSA				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Describe generics and architecture of collection framework				
	CLO2	Apply Multithreading concepts into a real world scenarios				

	CLO3	Discuss distributed programming in RPC and RMI
	CLO4	Discuss Database connection interfaces and classes
	CLO5	Develop a Java applications using Java Servlets and/or Java Server Pages

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√												√		√				√		
CLO2		√											√		√		√	√			√
CLO3			√										√		√				√		√
CLO4				√									√		√		√				√
CLO5				√									√		√					√	√

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	Problems Solving Skills								
	2	Research								
	3…etc.	System Development								
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: Generics and Collections Why Use Generics? Generic Classes; Generic Interfaces; Generic Methods; Generic Bounds; Collection API: Interfaces and Classes,	CLO1&3	√		√					10hrs

	Algorithms and Iterators; 1.4. Comparators; Serialization with Generics								
	Chapter 2: Multithreading: 2.1. Introduction; 2.2. thread states; priorities and thread scheduling; 2.3. creating and Executing threads; 2.4. thread synchronization, 2.5. Deadlocks.	CLO1 &4	√		√				15 hrs
	Chapter 3: Database Programming: 3.1. Introduction to JDBC, Types of Drivers, Two-Tier 3.2. Client/Server Model, Three-Tier Client/Server Model,	CLO3& 4	√		√				15 hrs

	3.3. Basic Steps of JDBC, 3.4. Creating and Executing SQL Statement, Batch Update, The Result Set Object, Working with Database MetaData Interface.								
	Chapter 4: Network Programming: 4.1. Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets 4.2. URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – 4.3. Java Messaging services	CLO1& 3		√		√			10 hrs
	Chapter 5: Distributed Programming: Remote Method Invocation(RMI), Stubs and skeletons, Remote object, rmic, rmiregistry, Remote interface, Naming.lookup, ClassNotFoundException, Naming.bind, JAR file creation	CLO3& 4	√		√				15 hrs

	Chapter 6: Servlets & JSP 6.1. Introduction to Servlets, Lifecycle of a Servlet, JSDK, 6.2. The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters, The javax.servlet HTTP package, Handling Http Request & Responses, 6.3. Using Cookies-Session Tracking, Security Issues. 6.4. Introduction to JSP.	CLO3& 4	√		√				15 hrs
	Total							80 hrs	
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (5%)	1	1	2hrs

	2	Assignments	Assignment II Lab (10%)	1	1	2hrs
	3	Project	Mini Project (10%)	2	6	8hrs
	4	Others	Mid Exam (25%)	3	8	11hrs
	5	Quize	Quiz (10%)	2		2
					Total	25 hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	3hrs	12hrs	15hrs
					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	Computer Lab
		2	Software
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.

13	Text book and reference: (note: ensure the latest edition /publication)	1	"Java: How to Program", P.J. Deitel & H.M Deitel, 9th Edition Pearson Education, 2011.
		2	"Java 2: The Complete Reference", Herbert Schildt, 8th Edition, Tata McGraw Hill, 2011.
		3	http://www.java-made-easy.com/java-programming-tutorials.html
		4	George Reese, "Database Programming with JDBC and Java" 2nd Edition OReilly 2001
		5	Jason Hunter, "Java Servlet Programming", 2nd Edition, O'Reilly.

Adama Science and Technology University						
1	School: ***Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***		
2	Course Category	***Core Module***				
	Course Name	***Software Testing and Quality Assurance***				
	Course Code:	***SEng4201***				
3	Synopsis:	This course gives fundamental concepts of software testing on a new software development through software quality assurance methods and principles in order to produce reliable , cost effective and scalable software product that meet users need and organizational standards				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	4	Major Mandatory

6	Credit Hour:		3
7	Prerequisite/ Co-requisite: (if any)		**SEng320**1 Software Requirements engineering **SEng320**4 - Software Design and Architecture
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:		
	CLO1	Discuss basic concepts of software testing and quality assurance	
	CLO2	Elaborate software testing design and planning techniques	
	CLO3	Differentiate type testing and testing tools	
	CLO4	Describe testing process and Test report	
	CLO5	Identify software quality characteristics and metrics	
	CLO6	Discuss Professional ethics, current trends on testing	
	CLO7	Analyze the quality of the software based on software quality metrics	

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

Course Learning Outc	Program Learning Outcomes (PO)									
	PO	P	PO	PO4	PO5	P	PO	P	PO9		Assessment

	omes (CLO)	1	O2	3			O6	7	O8		Teaching Methods				Test	Quiz	Assignment	Project	Lab-report
											L	T	P	C					
	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	Automated Testing tools (Selenium,TestingWhiz, Telerik TestStudio,Tosca Testsuite,
	2	Real-Time and Embedded Systems Testing
	3…etc.	Open source test tools such as Watir

11	Distribution of Student Learning Time (SLT)					
	Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
			Guided learning (F2F)	Guided Learning Total (F2F)	Independent Learning	

								(NF2F)	
			L	T	P	O			
	Chapter 1: Introduction to Software Testing 1.0. Introduction 1.1. The Testing Process 1.2. What is Software Testing? 1.3. Why Should We Test? What is the Purpose? 1.4. Who Should do Testing? 1.5. How Much Should We Test? 1.6. Selection of Good Test Cases 1.7. Measurement of Testing 1.8. Incremental Testing Approach 1.9. Basic Terminology Related to Software Testing	CLO1	6					8	10

	1.10. Testing Life Cycle 1.11. When to Stop Testing? 1.12. Principles of Testing 1.13. Limitations of Testing								
	Chapter 2: Levels of Testing 2.1 UNIT TESTING 2.1.1 Concept of Unit Testing 2.1.2 Static Unit Testing 2.1.3 Defect Prevention 2.1.4 Dynamic Unit Testing 2.1.5 Debugging 2.2 CONTROL FLOW TESTING 2.2.1 Control Flow Graph 2.2.1 Paths in a Control Flow Graph 2.2.1 Path Selection Criteria 2.2.1.1 All-Path Coverage Criterion	CL O2	8					6	21

	2.2.1.1 Statement Coverage Criterion 2.2.1.1 Branch Coverage Criterion 2.2.1.1 Predicate Coverage Criterion 2.3 DATA FLOW TESTING 2.3.1 Data Flow Anomaly 2.3.2 Overview of Dynamic Data Flow Testing 2.3.3 Data Flow Graph ,Terms and Testing Criteria 2.3.4 Comparison of Data Flow Test Selection Criteria 2.4 DOMAIN TESTING 2.4.1 Domain Error 2.4.2 Testing for Domain Errors 2.4.3 Sources of Domains 2.4.4 Types of Domain Errors 2.4.5 ON and OFF Points								

	2.4.6 Test Selection Criterion 2.4 SYSTEM INTEGRATION TESTING 2.4.1 Concept of Integration Testing 2.4.2 Different Types of Interfaces and Interface Errors 2.4.3 Granularity of System Integration Testing 2.4.4 System Integration Techniques 2.4.4.1 Incremental 2.4.4.2 Top Down 2.4.4.3 Bottom Up 2.4.5 Software and Hardware Integration testing 2.4.6 Test Plan for System Integration 2.4.7 Off-the-Shelf Component Integration Testing								

	2.5 SYSTEM TEST 2.5.2 Basic Tests 2.5.2.1 Boot Tests 2.5.2.2 Upgrade/Downgrade Tests 2.5.2.3 Light Emitting Diode Tests 2.5.2.4 Diagnostic Tests 2.5.2.5 Command Line Interface Tests 2.5.3 Functionality Tests 2.5.3.1 Communication Systems Tests 2.5.3.2 Module Tests 2.5.3.3 Logging and Tracing Tests 2.5.3.4 Element Management Systems Tests 2.5.3.5 Management Information Base Tests 2.5.3.6 Graphical User Interface Tests								

	2.5.3.7 Security Tests 2.5.3.8 Feature Tests 2.5.4 Robustness Tests 2.5.4.1 Boundary Value Tests 2.5.4.2 Power Cycling Tests 2.5.4.3 On-Line Insertion and Removal Tests 2.5.4.4 High-Availability Tests 2.5.4.5 Degraded Node Tests 2.5.5 Interoperability Tests 2.5.6 Performance Tests 2.5.7 Scalability Tests 2.5.8 Stress Tests 2.5.9 Load and Stability Tests 2.5.10 Reliability Tests 2.5.11 Regression Tests								

	2.5.12 Documentation Tests 2.6 ACCEPTANCE TESTING 2.6.1 Types of Acceptance Testing 2.6.2 Acceptance Criteria 2.6.3 Selection of Acceptance Criteria 2.6.4 Acceptance Test Plan 2.6.5 Acceptance Test Execution 2.6.6 Acceptance Test Report								
	Chapter 3: Test Management 3.1 Risk and Testing 3.2 Test Organization and Independence 3.3Roles within the Test Team 3.4 Test Strategy 3.5 Test Approach 3.6Test Plan 3.7Test Planning Activities	CL O3, CL O4, CL O7	6					5	14

	3.8 Test Estimation 3.9Test Progress Monitoring and Control 4.10 Test Reporting 4.11Test Control								
	Chapter 4: Tool Support for Testing 4.1 What is a Test Tool? 4.2 Benefits and Risks of using a Test Tool 4.3 Types of Test Tool ● Tool Support for Management of Testing and Tests ● Tool Support for Static Testing ● Tool Support for Test Specification ● Tool Support for Test Execution and Logging ● Tool Support for Performance and Monitoring ● Tool Support for Specific Application	CLO3	3					6	13

	Areas • Tool Support using Other Tools 4.4 Test Tool Limitations 4.5 Tool Selection Advice 4.6 Key Factors in the Selection of a Tool								
	Chapter 5: Legal, Ethical, and Professional Aspects of Testing 5.1 The Ethical Software Tester 5.2 Professional Responsibility of Software Tester 5.3 ACM Code of Professional Conduct and Ethics	CLO6	6					4	8
	Chapter 6: Software Quality Assurance 5.1 Quality factors and criteria 5.2 Relationship between quality factors and quality criteria	CLO4	7					5	16

	5.3 Quality Metric 5.4 Quality characteristic 5.5 software Quality standard								
	Chapter 7: Current trends of Testing 6.1 Change-Driven Testing 6.2 Testing in DevOps 6.3 Testing Autonomous Systems 6.4 Testing Artificial Intelligence system 6.5 Testing as a service	CL O6	6					4	16
	Total		42					38	80hrs
	Assessment								
	Continuous Assessment		Percentage Total-60(%)			F2F	NF2F		SLT
	1	Assignments	Assignment I &II (20%)			2	8:30		10:30
	2	Quiz/Test	Quiz I & II (25%)			2	2		4
	3	Project	Course Project (15%)			2	20		22

<table>
<tr><td></td><td>5</td><td colspan="3">Choose an item.</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="7" align="right">Total</td><td>36:30hrs</td></tr>
<tr><td></td><td colspan="2">Final Exam</td><td colspan="2">Percentage 40 (%)</td><td>F2F</td><td colspan="2">NF2F</td><td>SLT</td></tr>
<tr><td></td><td colspan="2">Final Exam</td><td colspan="2">40%</td><td>2:30</td><td colspan="2">11</td><td>13:30hrs</td></tr>
<tr><td></td><td colspan="7" align="right">Grand Total SLT</td><td>120hrs</td></tr>
<tr><td></td><td colspan="8">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.</td></tr>
</table>

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	Text book and reference: (note: ensure the latest edition /publication)	1	**Ali Mil,Fairouz Tchier,***Software Testing :Concepts and Operations,2015,* by John Wiley & Sons
		2	Kshirasagar Naik, Priyadarshi Tripathy, Software Testing And Quality Assurance : Theory and Practice,2008
		3	Stephan Goericke, The Future of Software Quality Assurance,2020,Springer open

		4	RAJIV CHOPRA, PHD, Software Testing, 2018
			Web Reference: http://online.stanford.edu/ | http://nptel.ac.in/ https://ocw.mit.edu/ | http://groups.csail.mit.edu/pag/ http://groups.csail.mit.edu/pag/ | http://capone.mtsu.edu/storm/ http://www.testingeducation.org/BBST/ | https://www.stickyminds.com/

	Adama Science and Technology University	
1	School: ***Electrical engineering and computing***	Department: ***Computer Science and Engineering***
2	Course Category	***M. Mandatory***
	Course Name	***Software Evolution and Maintenance***
	Course Code:	***Seng4203***
3	Synopsis:	This course is an introduction to the main issues related to software systems aging and evolution. It examines some of the available methods and technologies for software reverse engineering and reengineering as well as some of the managerial and planning issues specific to software reengineering projects. This course explores the foundations of software maintenance by introducing several challenges linked to software evolution along with support

			tools to approach them.				
4	Name(s) of Academic Staff:						
5	Semester and Year offered:		Semester:		Year:		
6	Credit Hour:		3				
7	Prerequisite/ Co-requisite: (if any)		Fundamentals of Software Engineering(SEng2206)				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	▪ Explain the basic concept of software Evolution and Maintenance					
	CLO2	▪ Apply software maintenance fundamentals, including terminology; the nature of and need for maintenance; maintenance costs; evolution and categories of maintenance					
	CLO3	▪ Analyze key issues in software maintenance, to include technical issues; management issues; cost estimation; and software maintenance measurement					
	CLO4	▪ Apply the best practices maintenance process					
	CLO5	▪ Explain the concept of reverse Engineering					
	CLO6	▪ Explain the concept of software administration and performance.					
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:						
	Cours	Program Learning Outcomes (PO)					

	e Learning Outcomes (CLO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods				Assessment				
																		Test	Quiz	Assignment	Project	Lab-report
														L	T	P	O					
	CLO1								√					√						√		
	CLO2								√					√					√			
	CLO3								√					√						√		
	CLO4									√				√						√		
	CLO5									√				√				√			√	

<table>
<tr><td></td><td colspan="6">Indicate the relevance between the CLO and PO by ticking “√”on the appropriate relevant box</td></tr>
<tr><td rowspan="4">10</td><td colspan="6">Transferable Skills (if applicable)
(Skills learned in the course of study which can be useful and utilized in other settings)</td></tr>
<tr><td>1</td><td colspan="5">It will be founding block for use the techniques, skills, and modern engineering tools
Necessary for engineering practice.</td></tr>
<tr><td>2</td><td colspan="5"></td></tr>
<tr><td>3…etc.</td><td colspan="5"></td></tr>
<tr><td rowspan="3">11</td><td colspan="6">Distribution of Student Learning Time (SLT)</td></tr>
<tr><td colspan="2" rowspan="2">Course Content Outline</td><td rowspan="2">CLO</td><td colspan="3">Teaching and Learning Activities</td><td rowspan="2">Total (SLT)</td></tr>
<tr><td>Guided learning (F2F)</td><td>Guided Learning (NF2F)</td><td>Independent Learning(NF2F)</td></tr>
</table>

			L	T	P	C			
	Chapter 1: **Fundamentals of Software Maintenance and Evolution** 1.1 Definition and methodology 1.2 Nature of Maintenance 1.3 Need for Maintenance 1.4 Maintenance Cost 1.5 Evolution of Software 1.5 Categories of Software	1	4					10	14hrs
	Chapter 2**: Issue in Software Maintenance and Evolution** 2.1 Technical Issue 2.2 Management Issue 2.3 Maintenance cost Estimation 2.4 Software Maintenance cost Estimation	3	4					10	14hrs

	Chapter 3**: Reverse Engineering** 3.1 Definition 3.2 Reuse and Reusability 3.3 Maintenance measures	5	4					10	14hrs
	Chapter 4: **Configuration Management** 4.1 Configuration management 4.2 Change Control 4.3 Management and organizational issues 4.4 Management responsibilities 4.5 Documentation.	3	6					10	16hrs
	Chapter 5: **Building and Sustaining Maintainability** 5.1 Maintenance tools: Criteria for selecting tools, taxonomy of tools 5.2 Quality Assurance,	4	6					12	18hrs

	5.3 Configuration management 5.4 Program understanding and reverse engineering testing								
	Chapter 6: **Software Administration** 6.1 System logs**,** updates, patches, and configuration changes, 6.2backups. Installing and configuring hardware and software. 6.3System performance tuning. Performing routine audits of systems and software. 6.4 Backup	6	6					12	18hrs
	Total		31					64	95
	Assessment								
	Continuous Assessment	Percentage Total-60(%)					F2F	NF2F	SLT
	1 Assignments	Assignment I (10%)						3	3

	2	Assignments	Assignment II (10%)		3	3
	3	Quiz	10%	2	30	2:30
	4	Others	Mid Exam (30%)		2:30	2:30
					Total	11
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%		14	
					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	Workshop
		2	
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
1	Text book and reference:	1	Software evolution and maintenance : a practitioner's approach /

3	(note: ensure the latest edition /publication)		Priyadarshi Tripathy,. Kshirasagar Naik , John Wiley & Sons, 2015 Armstrong A Takang and Penny A.Grubb, “Software Maintenance: concepts and Practice”, International Thomson Computer press, London. Roger S Pressman, “Software Engineering”, 6th edition, Tata McGraw-Hill, 2004.

Adama Science and Technology University					
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science and Engineering***			
2	Course Category	***Major Elective***			
	Course Name	***Software Process and Project Management***			
	Course Code:	***SEng4204***			
3	Synopsis:	This course will introduce the area of software engineering processes is concerned with software process definition, software life cycles, software process assessment and improvement, software measurement, and software engineering process tools and presenting basic software project management techniques and approaches and aiming to develop a critical awareness of the challenges and shortcomings of the area. Software Process and Project Management is an important area of study since most non-trivial software development efforts will be making use of some type of project management approach in an aim to manage the development process in such a way that the Software meets its requirements and is on-time and within budget.			
4	Name(s) of Academic Staff:				
5	Semester and Year offered:	Semester:		Year:	
6	Credit Hour:	3			

7	Prerequisite/ Co-requisite: (if any)	SEng3201-Software Requirement Engineering SEng3204 -Software design and architecture
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	▪ Understand the issues involved in Software Process and Project management and the factors that affect Software quality;
	CLO2	▪ Understand the software assessment and improvement models
	CLO3	▪ Familiar with a range of standards, techniques and tools developed to support Software project management and the production of high-quality Software;
	CLO4	▪ Develop Software project plans, supporting Software quality plans and risk management plans.
	CLO5	▪ Capable of actively participating or successfully managing a Software development project by applying project management concepts
	CLO6	▪ Apply software project management tools

9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																			
	Course Learning Outcom	Program Learning Outcomes (PO)																		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching	Assessment					
															Tes	Qu	Mi	Assign	Proje	Final

	es (CLO)													Methods				t	iz	d	ment	ct	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 (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						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning(NF2F)	
			L	T	P	O			
	Chapter 1: **Introduction to Software Process and Life Cycle** 1.1 Software Process Management 1.2 Software Process Infrastructure 1.3 Categories of Software Process 1.4 Software Life Cycle Model 1.5 Software Process Adaption 1.6 Practical Consideration	1	4					4	8hrs

	Chapter 2: **Software Process Assessment and Improvement** 2.1 Software process Assessment Model 2.2 Software process Assessment Method 2.3 Software process Improvement Models 2.4 Continuous and Staged Software Process Ratings	2	6					7	12hrs

	Chapter 3: **Software Measurement** 3.1 Software Process and Product Measurement 3.2 Quality of Measurement Result 3.3 Software Information Model 3.4 Software Process Measurement Techniques	3	5					4	9hrs
	Chapter 4: **Software Project Management and Planning** 4.1 Software Project and Project Planning 4.2 Integration Management 4.3 Project Plan Development 4.4 Project Plan Execution 4.5 Scope Management	4	4					4	8hrs

	Chapter 5: **Project Scheduling and Project Cost Management** 5.1 Time Management 5.2 Project Network Diagrams 5.3 Principles of Project Cost Management 5.4. Resource Planning 5.5 Cost Estimating 5.6 Cost Budgeting 5.7 Cost Control	4	4					5	9hrs
	Chapter 6: **Project Quality Management** 6.1 Quality Project 6.2 Stages of Project Quality Management 6.3 Quality Standards 6.4 Tools and Techniques for Quality	3	4					7	11hrs

	Control								
	Chapter 7: Project Communication Management 7.1. Communications Planning 7.2. Information Distribution 7.3. Performance Reporting 7.4. Administrative Closure 7.5. Suggestions for Improving Project communications	5	4					4	8
	Chapter 8: Project Risk Management 8.1. The Importance of Project Risk Management 8.2. Common Sources of Risk in IT project	5	4					4	8

	8.3. Risk Identification 8.4. Risk Quantification 8.5. Risk Response Development and Control								
	Chapter 9: Software Process and Project Management Tools 9.1 Demonstration on current software process and project management tools	6			4			2	6
	Total		35		4			41	80
	Assessment								
	Continuous Assessment	Percentage Total-60(%)	F2F	NF2F		SLT			

	1	Assignments	Assignment I (10%)		5	5	
	2	Assignments	Assignment II (10%)		5	5	
	3	Project	15%		10	10	
	4	Others	Mid Exam (25%)	2	8	10	
	5	Choose an item.					
	Total						30
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT	
	Final Exam		40%		10	10	
	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.						
1	Special	1	Choose an item.				

2	requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	2	Choose an item.	
		3	Choose an item.	
		4	Choose an item.	
		5	Choose an item.	
13	Text book and reference:	1	*Steve McConnell, "Software Project – Survival Guide", Microsoft Press..*	
		2	Meri Williams, "The Principles of Project Management", SitePoint Pvt., ISBN 978-0-9802858-6-4, 2008.	
		3	Futrell and Shafer, "Quality Software Project Management", Wiley, 2010	

Adama Science and Technology University		
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science & Engineering***
2	Course Category	***Core Module***
	Course Name	***Computer Systems Security***
	Course Code:	***Seng4205***
3	Synopsis:	This course covers fundamental issues and first principles of security and information assurance. The course

		will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems. Other topics covered include basics of cryptography (e.g., digital signatures) and network security (e.g., intrusion detection and prevention), risk management, security assurance and secure design principles, as well as e-commerce security. Issues such as organizational security policy, legal and ethical issues in security, standards and methodologies for security evaluation and certification will also be covered.
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: I Year: 4
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 fundamentals concepts of computer security apply to different components of computing systems.
CLO2	Identify the basic cryptographic techniques using existing software in maintain information security.
CLO3	Describe how malicious attacks, threats, and protocols for security vulnerabilities impact a systems infrastructure.
CLO4	Describe the importance of network principles and architecture to security operations.

	CLO5	Define how to apply standard responses in the case spyware and malware is occurs.
	CLO6	Describe information security standards, compliance laws, and security policy to real-world implementation in both the private and public sector
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Teaching Methods				Assessment				
													L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√												√					✓			✓
CLO2				√									√		√		√	✓	√		✓
CLO3		√											√					✓			✓
CLO4			√										√		√		√		√		✓
CLO5				√									√		√		√				✓
CLO6						√							√		√					√	✓

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	Create secure software applications using object-oriented, structured, scripting and low-level programming techniques and software engineering methodologies, which pertain to development, testing and documentation activities.
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 Security Concepts 1.1. Networking Vs Security	1	√				√	√	15hrs
1.2. Network protocols and TCP/IP								
1.3. Different Attacks								
1.4. Malicious Codes								

	1.5. Basic security terms								
	1.6. Authentication Mechanisms								
	Chapter 2 :Basics of Cryptography 2.1. Classic crypto techniques	2	√		√		√		25hrs
	2.2. Ideas of Confusion and Diffusion								
	2.3. Asymmetric (public key) crypto								
	2.4. Symmetric crypto								
	2.5. Hash functions								
	2.6. Digital signatures								
	Chapter 3:**Infrastructure Security**	4	√		√		√		15hrs
	3.1. Security concerns of different types of devices								
	3.2. Network Monitoring / Diagnostics tools								
	3.3.Security concerns of different types of								

	media								
	3.4. Storage Media								
	3.5. Intrusion detection mechanisms								
	3.6.Security Baselines								
	Chapter 4: Managing Communication and Network Security 4.1. Remote access technologies:	2&4	√		√		√		18hrs
	4.2. IPSEC (Internet Protocol Security)								
	4.3. Email security concepts								
	4.4. How PGP and S/MIME works:								
	4.5. SSL (Secure Sockets Layer)								
	4.6. TLS (Transport Layer Security)								
	4.7. HTTP/S								
	4.8. Directory Security Concepts:								
	Chapter 5: Security Policies	2&6	√				√	√	10hrs

	Total									83hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	1	5	6hrs
2	Quize	Quiz (10%)	1		1hr
3	Lab-report	10%	2	5	7hrs
4	Others	Mid Exam (30%)	2	8	10hrs
5	Choose an item.				
				Total	24hrs

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	40%	3	10	13hrs
			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.

1	Special requirements	1	Computer Lab

2	and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	2	
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference:	1	Computer Security Fundamentals: Computer Security Fundamentals, 2/Edition, William (Chuck) Easttom, II. (2012, Pearson Education Company), ISBN-13:9780789748904

AdamaScience and Technology University		
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science & Engineering***
2	Course Category	***Major Mandatory***
	Course Name	***Introduction to Artificial Intelligence***
	Course Code:	***Seng4208***
3	Synopsis:	This course is an introductory course on Artificial Intelligence(AI) that presents an overview of AIprinciples 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. ThePROLOG and others AI programming language will also be introduced.					
4	Name(s) of Academic Staff:						
5	Semester and Year offered:	Semester:	II	Year:	3		
6	Credit Hour:	3					
7	Prerequisite/ Co-requisite: (if any)	CSE 2206Discrete Mathematics for Computer Science					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Discuss the basic principles of AI and different types of AI agents.					
	CLO2	Identify various AI search algorithms.					
	CLO3	Apply knowledge representation, reasoning, and machine learning techniques to real-world problems.					
	CLO4	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.					
	CLO5	Develop a simple knowledge-based system.					
9	Mapping of the Course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:						

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
														Test	Mid	Assignment	Project	Final
										L	T	P	O		✓			✓
	CLO1	√								√				✓	✓	√		✓
	CLO2			√						√		√		√	✓			✓
	CLO3				√					√		√				√		✓
	CLO4		√							√		√						✓
	CLO5							√		√		√				√	√	✓
	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…etc .	Expert Systems
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 1:**Introduction to Artificial Intelligence** 1.1Definitions and Views of Artificial Intelligence (Intelligence, AI, AI Thoughts),	CLO1	√		√				10hrs
1.2 Brief History and foundations of AI								
1.3Roles of AI								
1.4Main Areas of AI								
1.5 Achievements and Big Open Questions								

	Chapter 2:**Intelligent Agents** 2.1Definitions(Agent, Intelligent Agent	CLO1	√		√				15hrs
	2.2Agent Types(Rational, Omniscience Agent, Ideal Rational Agent, etc.), Properties of an Agent								
	2.3Parts of an Agent								
	2.4Factors 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								
	Chapter 3:**Problem Solving** 3.1Solving Problems by Searching (informed, Uninformed)	CLO2,3	√		√				17hrs
	3.2Beyond Classical Search(Simulated Annealing, Genetic algorithms)								
	3.3 Legitimacy of Intellectual Property Protection for Software								
	Chapter 4:**Knowledge and Reasoning**	CLO4	√		√				8hrs

	4.1Logical Agents								
	4.2First-Order Logic								
	4.3Inference in First-Order Logic								
	4.4 Classical Planning, Planning and Acting in the Real World								
	4.5 Knowledge Representation								
	Chapter 5:**Uncertain Knowledge and Reasoning** 5.1Quantifying Uncertainty	CLO4	√		√				10hrs
	5.2Probabilistic Reasoning								
	5.3 Probabilistic Reasoning over Time								
	5.4 Making Simple Decisions, Making Complex Decisions								
	Chapter 6:**Learning** 6.1Learning from Examples, Knowledge in Learning	CLO4	√				√		10hrs

	6.2 Learning Probabilistic Models, Reinforcement Learning, or Machine								
	Chapter 7: C**ommunicating, Perceiving and Acting** **7.1** Natural Language Processing	CLO5	√				√		10hrs
	7.2 Natural Language for Communication								
	7.3 Perception, Robotics								
	Total								80hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	2	4	6
2	Quiz	Quiz (10%)	1		1
3	Project	15%	2	10	12
4	Others	Mid Exam (25%)	2	6	8
				Total	27hrs

	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	10	13hrs
					Grand Total SLT	120hrs
	L = Lecture, T = Tutorial, P = Practical, O = Others, F2F = Face to Face, NF2F = Non Face to Face Note: CLO column refers 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	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) Software	1	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
			SWI-Prolog. Use the stable versions and the self-installing executable for Windows. For this course we need only the basic components. Reference: The World Wide Web Virtual Library: Logic Programming (Prolog)

Adama Science and Technology University		
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science & Engineering***
2	Course Category	***Core Elective/focused Area Module***
	Course Name	***Ethics and Professionalism in Computing***
	Course Code:	***Seng5203***

3	Synopsis:	This course explores ethical issues in the field of computing. Students will develop the skills needed to identify and analyze various ethical concerns. We will cover standard ethical concepts and theories, as well as standard methods of ethical analysis. I place a strong emphasis on practical application of the ethical process. This means that once you've learned the basics of ethical analysis, you'll apply that information to different scenarios. It's important to keep in mind that the field of ethics considers many different viewpoints. A good ethicist will fairly evaluate positions that may, on a personal level, be far outside his or her comfort zone. I expect you to become good ethicists! Your ethical analysis work will usually be in the form of an essay, so you'll practice your writing skills at the same time that you practice your ethics skills. Initial writing assignments will work on grammar, punctuation, and sentence structure.					
4	Name(s) of Academic Staff:						
5	Semester and Year offered:	Semester:	II	Year:	5		
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	Discover common ethical concepts and theories related to computing.					

	CLO2	Analyze ethical dilemmas and articulate a clear, descriptive account.
	CLO3	Demonstrate one or more processes of philosophical analysis
	CLO4	Identify common ethical issues facing professionals in the field of information technology
	CLO5	Apply ethical concepts and an analytical process to common dilemmas found in the information technology field.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Teaching Methods				Assessment				
													L	T	P	O	Test/ Quiz	Assignment	Project	Lab-report	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	Demonstrate writing competency in the following areas: Development of ideas, Organization, Appropriate voice, Proper mechanics and Relevance to assignment

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:**Computers and Ethics**	CLO1	√			√			10hrs

	1.1Basics of Computer Ethics								
	1.2 Reliability and safety of Computer Systems								
	1.3Ethical Perspectives								
	1.4Justice and Social Contract Theory								
	1.5 Professional code of Ethics								
	Chapter 2:**Privacy** 2.1Protecting Software	CLO1, CLO2	√			√			15hrs
	2.2Privacy and Information								
	2.3Privacy perspectives								
	2.4Computer Crime and Legal Issues								
	2.5 Computer and Social Issues								
	Chapter 3:**Intellectual Property** 3.1Intellectual property Rights	CLO2,3	√			√			20hrs
	3.2Trade Secrets								
	3.3Patents								

	3.4.Ease of Replication								
	3.5.Fair use and Restrictions								
	3.6.Peer to Peer Protections								
	3.7.Open Source								
	Chapter 4:**Networked Communication** 4.1Email and Spam	CLO4, CLO5	√			√			8hrs
	4.2Censorship								
	4.3Freedom of Expression								
	4.4 Trust on the Internet								
	4.5 Internet Addiction								
	Total								53hrs

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)		√	10

	2	Quize	Quiz (10%)	√		2
	3	Project	10%		√	10
	4	Others	Mid Exam (30%)	√		2
	5	Choose an item.				
					Total	24hrs
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	√		3hrs
					Grand Total SLT	80hrs
	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	
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
1	Text book and	1	1. *Ethics for the Information Age, MichaelJ. Quinn, 5 th Edition, Pearson/Addison-Wesley,*

3	reference: (note: ensure the latest edition /publication)		*2011, ISBN 978-0-13-213387-6* 2. *Blown to Bits: Your Life, Liberty, and Happiness after the Digital Explosion, Hal Abelson, 1st edition, Addison-Wesley, 2009, ISBN 978-0-13-285553-2.*

Adama Science and Technology University					
1	School: ***Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***	
2	Course Category	***Core Module***			
	Course Name	***Introduction to Software Integration and Engineering***			
	Course Code:	***SEng5204***			
3	Synopsis:	This course studies the process of integrating different systems and software applications by examining current and emerging trends, strategies, and techniques for developing systems integration solutions effectively. Example topics covered include, but are not limited to: documenting integration requirements using business process models, designing integration solutions reusing patterns, and implementing integration solutions using service-oriented architecture.			
4	Name(s) of Academic Staff:				
5	Semester and Year	Semester:	II	Year:	5

	offered:				
6	Credit Hour:	3			
7	Prerequisite/ Co-requisite: (if any)	Fundamentals of Software Engineering(SEng 2206)			
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:				
	CLO1	Explain key challenges, concepts, drivers, strategies and apply the organizational and managerial issues related to systems integration projects			
	CLO2	Explain and apply key systems integration architecture, methodologies, and technologies			
	CLO3	Identify and assess current and emerging systems integration tools			
	CLO4	Design feasible solutions for an integration problem that utilizes proven design solutions described in integration patterns			
	CLO5	Identify human, security, social, and entrepreneur issues and responsibilities relevant to engineering software and the digitalization of services			
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:				

Course Learning Outcomes	Program Learning Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods	Assessment				
												Quiz	Assignment	Project	Lab-

	(CLO)																		re po rt
											L	T	P	O					
	CLO1								√		√				√		√		
	CLO2								√		√					√			
	CLO3								√		√							√	
	CLO4									√	√						√		
	CLO5	√									√						√		
	Indicate the relevance between the CLO and PO by ticking “√”on the appropriate relevant box																		
1 0	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)																		
	1	Can Develop and understanding of how software development impacts system development.																	
	2																		

	3…etc.								
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-1 **Overview of Systems** 1.1 Types of systems integration, 1.2 Systems integration technologies 1.3 Benefits and limitation of integration 1.4 Enterprise Resource Planning 1.5 Systems and business process models	1	4					8	12hrs
	Chapter 2**:Middleware** 2.1 Middleware Models 2.2 Types of Middleware	2	4					8	12hrs

	2.3 Synchronous vs Asynchronous 2.4Communication Models									
	Chapter 3: **ERP Systems and Processes** 3.1 Functional Areas and Business Processes 3.2 ERP Modules 3.3 Enterprise Systems Architecture	5	4					8	12hrs	
	Chapter 4: **Solving Integration Problems using Patterns** 4.1 Middleware - Recap 4. 2 Tight coupling 4.3 Loosely coupled 4.4 Message Construction 4.5 System Management 4.6 System Management	4	4					8	12hrs	
	Chapter 5:**XML and Application**	4	6					8	12hrs	

	Integration 5.1 XML: Elements 5.2 XML Schema and XML Document 5.3 Extensible Stylesheet Language Transformations (XSLT) 5.4 XML and Application Integration								
	Chapter 6: **Service-oriented Architecture and Web Services** 6.1 Service-Oriented Enterprise (SOE) 6.2 Service Computing 6.3 Web Service Standards: 6.4 Web-based Application Development 6.5Web Service Description Language (WSDL)	2	4					8	12hrs
	Chapter 7: **Advanced Web Services technologies**	2	4					8	12hrs

	7.1 Key and Basic Web service standards 7.2 First- and Second-Generation Web Service Standards 7.3 Web Services Business Process Execution Language (WS-BPEL) 7.4 Security Concepts – Authorization, Integrity and Confidentiality								
	Chapter 8: **System integration tools** 8.1 Assessment of system integration tools	3	2					8	10
	Total		34					62	86

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

	2	Group Assignments	Assignment (5%)		3	3
	3	Project	(15%)		7	7
	4	Test	(5%)	1	2	3
	5	Others	Mid Exam (30%)	2	5	7
					Total	22
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	9	12
					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	Computer Lab
		2	Software
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
1	Text book and reference:	1	Enterprise Integration: The Essential Guide to Integration Solutions (1st Edition) Author: Beth Gold-Bernstein and William Ruh Publisher: Addison-Wesley

3	(note: ensure the latest edition /publication)		Professional
		2	Next Generation Application Integration: From Simple Information to Web Services (1st Edition) Author: David S. Linthicum Publisher: Addison-Wesley Professional
		3	Enterprise Systems for Management (2nd Edition) Author: Luvai Motiwalla and Jeffrey Thompson Publisher: Prentice Hall

Adama Science and Technology University						
1	School: ***Electrical Eng. & Computing***			Department: ***Electronics & Communication Eng.***		
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:	TBA				
5	Semester and	Semester:	I	Year:	III	

	Year offered:					
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	Design and implement a logic circuit using various logic gates
	CLO3	Apply Boolean algebra and Karnaugh maps to simplify and design logic circuits.
	CLO4	Apply the concepts of 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

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	L	T	P	O	Laboratory	Quiz	Assignment	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 (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	√	√	√		√	√	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	√	√	√		√	√	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	√	√	√		√	√	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	√	√	√		√	√	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	√	√	√		√	√	20hr
	5.1. Sequential logic circuit • Flip flops • Latches • Edge triggered flip flops • Master slave flip flops Applications								
	5.2. Counters								

	• Asynchronous counters • Synchronous counters • Design of synchronous counters								
	Chapter 6: **Shift registers**	CL05	√	√	√		√	√	15hr
	• Basic shift registers • Serial in serial out registers • Serial in parallel out Registers • Parallel in serial out Registers • Parallel in parallel out registers Jonson’s counter								
	Chapter 7 **Memory and Programmable Logic**	CL06	√	√	√		√	√	20 hr.
	• Random-Access Memory • Memory Decoding • Read-Only Memory • Programmable Logic Array • Programmable Array Logic								
	Total								130hr

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Quiz	10%	√		1hr.
2	Lab-report	20 %	√	√	14hr
3	Assignment	10%	√	√	10hr

	4	Mid exam	20%	√		2hr
	5					
					Total	27 hr.
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam			√		3hr
					Grand Total SLT	160 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			

<table>
<tr><td>1</td><td colspan="3">School: Choose an item.</td><td colspan="4">Department: Choose an item.</td></tr>
<tr><td rowspan="3">2</td><td colspan="2">Course Category</td><td colspan="5">Major</td></tr>
<tr><td colspan="2">Course Name</td><td colspan="5">Microprocessor and Interfacing</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="5">ECEg3304</td></tr>
<tr><td>3</td><td colspan="2">Synopsis:</td><td colspan="5"></td></tr>
<tr><td>4</td><td colspan="2">Name(s) of Academic Staff:</td><td colspan="5">Dawit Kefyalew</td></tr>
<tr><td>5</td><td colspan="2">Semester and Year offered:</td><td>Semester:</td><td>II</td><td>Year:</td><td>3</td><td></td></tr>
<tr><td>6</td><td colspan="2">Credit Hour:</td><td colspan="5">4</td></tr>
<tr><td>7</td><td colspan="2">Prerequisite/ Co-requisite: (if any)</td><td colspan="5">CSE3203 - Computer Architecture & Organization</td></tr>
<tr><td rowspan="5">8</td><td colspan="7">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="6">▪ Explain the general construction of microcomputer system.</td></tr>
<tr><td>CLO2</td><td colspan="6">▪ Compare microprocessors and microcontroller.</td></tr>
<tr><td>CLO3</td><td colspan="6">▪ Explain the architectures of 8086 microprocessors</td></tr>
<tr><td>CLO4</td><td colspan="6">▪ Discuss the instruction sets of 8086 microprocessors</td></tr>
</table>

	CLO5	▪ Analyze the basic concepts and programming of ARM microcontroller
	CLO6	▪ Understand the programming and interfacing techniques of 8086 microprocessor
	CLO7	▪ Design microcomputer based applications
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods				Assessment				
													L	T	P	O	Test	Quiz	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	
	2	
	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:**Introduction to Microcomputers** 1.1A microcomputer system	1 & 2	√	√		√				6hrs

	1.2 Microcontrollers vs Microprocessor								
	1.3Classification of Microprocessors								
	1.4Evolution of the Microprocessors								
	Chapter 2:**8086 Microprocessor Architecture** 2.1Review of the Basic Comp. Arch.	3	√	√		√			12hrs
	2.2The 8086 internal architecture								
	2.38086 special features								
	2.4Pin layout and signal descriptions								
	2.5 Physical memory organization								
	2.6 General bus operations								
	2.7 I/O addressing								
	2.8 Special processor activities								
	Chapter 3:**Programming The 8086 In Assembly Language** 3.1The Microcomputer (programmers' View)	4	√	√	√	√		√	18hrs

	3.28086 Addressing Modes								
	3.38086 Instruction Set Overview								
	3.4 Assembler directives & operators								
	3.5 Interrupts & Interrupt Service Routines (ISRs)								
	Chapter 4:**The ARM Microprocessor Architecture** 4.1Introduction	5	√	√	√	√		√	18hrs
	4.2Instruction set Architecture (ISA)								
	4.3The ARM Internal Bus								
	4.4 The Advanced Microcontroller Bus Architecture (AMBA)								
	4.5 Peripheral Interface Bus Standards								
	Chapter 5:**Interfacing Fundamentals** 5.1Definition of interface	5,6,7	√	√	√	√			12hrs
	5.2Components of an interface								

	5.3 Interface types								
	5.4 Data transfer Schemes								
	Chapter 6:**Memory Devices and Interfacing** 6.1Memory Devices	6,7	√	√	√	√			6hrs
	6.2 Address Decoding								
	6.3 ARM Memory Interface								
	Total								

	Assessment				
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	10%			
2	Quiz	5%			
3	Project	15%			
4	Others	Mid Exam (20%)			
5	Lab-report	10			
				Total	

	Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam	40%			
				Grand Total SLT	
	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	Workshop
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Douglas V Hall, 'Microprocessors and Interfacing-Programming and Hardware', 2nd Edition, Tata McGraw-Hill Publishing Company Limited
		2	A.K.Ray, K.M.Bhurchandy, 'Intel Microprocessors-Architecture, Programming and Interfacing', McGraw-Hill International Edition, 2004.
		3	Microprocessors and Interfacing, first Edition, 2009. A.P Douglas and D.A Douglas

AdamaScience and Technology University						
1	School: ***School of Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***		
2	Course Category	***Core Elective/focused Area Module***				
	Course Name	***Embedded Systems and Robotic Control***				
	Course Code:	***SEng4302***				
3	Synopsis:					
4	Name(s) of Academic Staff:	Dr. Rajesh Sharma R				
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	CSE3314-Microcomputer and Interfacing				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	▪ Understand the fundamental concept of hardware and software components.				
	CLO2	▪ Understand the deployment of embedded processors and supporting devices in real-world applications.				
	CLO3	▪ Design and construct the embedded system components and interpret with the application,				

	CLO4	▪ Understand the design concept of embedded system and apprehend the use ofembedded systems in industry.
	CLO5	▪ Ability to design a system or process to meet desired needsin realisticconstraints such as, health and safety,manufacturability, and sustainability.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
													Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√			√		√							√						√		
CLO2		√	√			√		√					√		√		√	√		√	√
CLO3			√		√	√							√		√		√	√	√		√
CLO4	√			√	√			√					√		√		√			√	√
CLO5			√		√		√						√				√			√	

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

1	Transferable Skills (if applicable)

0	(Skills learned in the course of study which can be useful and utilized in other settings)								
	1	Students can able to build the real-time application embedded systems.							
	2	Can build IoT and AI based embedded systems.							
	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: Introduction to embedded systems: **1.1** Introduction to embedded systems, 1.2 Difference between Embedded and General-Purpose Computing. 1.3 Embedded microcontrollers and their architectures. 1.4 Embedded system components.								4 hrs
	Chapter 2: **8051 Microcontroller:** 2.1 8051 Architecture, Pin								9 hrs

	configuration, Reset and system clock, timers and interrupts, Special function registers, Program/ data memory, addressing modes. 2.2 Introduction to 8051 assembly language programming, Arithmetic instructions, Logic and Compare instructions, Branch and conditional instructions, Single bit instruction programming.								
	Chapter 3:8051 Interrupts: 3.1Introduction to 8051 interrupts, programming of timer interrupts, programming external hardware interrupts. 3.2 programming the serial communication interrupts, interrupt priority in the 8051.								8 hrs
	Chapter 4: Serial Communication: 4.1 Basics of serial communication, 8051 connection to RS 232, 8051 serial communications Programming. 4.2 Real World Interfacing: Interfacing of A/D and D/A converter, interfacing stepper motor, interfacing of LCD, interfacing of sensors, interfacing keyboard.								8 hrs
	Chapter 5: PIC18F Family: 5.1 The Architecture of PIC family of devices, PIC18F instructions and assembly language, PIC18F programming model, instruction set, instruction format. 5.2 Data copy, arithmetic, branch, logical, bit manipulation and multiply divide operations. Stacks, subroutines and macros.								8 hrs

	Chapter 6: Interrupts and Timers of PIC: 6.1 Concepts of Interrupts and Timers. Interrupts and their implementation in PIC18. The PIC18 timers. The CCP. 6.2Use of Interrupts in applications. 6.3 I/O Port and Interfacing: Concepts of I/O interfacing and PIC18 I/O ports. Interfacing output and input peripherals.								9 hrs
	Total								42 hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (5%)		5	5
2	Assignments	Assignment II Lab (10%)	10		10
3	Project	Mini Project (10%)	5	5	10
4	Others	Mid Exam (30%)		25	25
5	Quize	Quiz (5%)		10	10
				Total	60
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		40%		40	40

		Grand Total SLT	40
	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	Software
		3	Workshop
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Michael Barr: Programming Embedded Systems in C and C ++
		2	Arnold S. Berger: Embedded Systems Design
		3.4 5	Embedded systems design by Steve Heath, Newnes. The 8051 Microcontroller and embedded systems by Muhammad Ali Mazidi, PHI PIC microcontroller and embedded systems by Muhammad Ali Mazidi, PHI.

AdamaScience and Technology University						
1	School: ***Electrical and Mechanical Engineering***			Department: ***Computer Science and Engineering***		
2	Course Category	***Major Elective***				
	Course Name	***Information Storage and Retrieval***				
	Course Code:	***SEng3301***				
3	Synopsis:	The course deals with the automated storage and information retrieval. Information Retrieval systems are deployed in university, company, and also libraries or any fields that depends on documents to do its work can benefit from Information Retrieval techniques. The goal of this course is aimed to analyze the advanced data structures, file structure databases. Concepts of key decoding by tree and Ranking techniques as well as Document retrieval and question and answering systems will also be discussed in the class. Furthermore, algorithms and techniques for automatic classification and storage of documents and algorithms of Information Retrieval must be instructed in the class. Relevant empirical studies which compare algorithms and data structures are also included.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	3	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)					

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Identify the various components/subsystems of an information storage and retrieval system
	CLO2	Contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models
	CLO3	Create queries in computer for information access and retrieval.
	CLO4	Examine the factors that influence the performance of an IR system.
	CLO5	Compare, contrast, and critically evaluate databases that were searched and information that was retrieved for relevance, recall, and precision
1.	CLO6	Understand the features of Internet-based information retrieval
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)										Teaching Methods				Assessment						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			L	T	P	O	Test	Quiz	Assignment	Mid Exam	Lab-Report	Project	Final
CLO1	√										√			√	√			√	√	√	√
CLO2	√		√								√					√		√	√	√	√
CLO3				√									√	√		√	√	√	√	√	√
CLO4				√							√						√		√	√	√
CLO5		√											√	√			√		√	√	√
CLO6	√		√					√			√		√			√	√		√	√	√

	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 Skills of organizing and processing data so that it can be easily accessible for decision making at the right time								
	2 Optimizing resources of storage and search algorithms to save money and time								
	3 Skills of research on new, better and efficient ways of handling data/information								
11	Distribution of Student Learning Time (SLT)								
	Course Content Outline	CLO	Teaching and Learning Activities: Guided learning (F2F)				Guided Learning (F2F)	Independent Learning (NF2F)	Total (SLT)
			L	T	P	O			
	1. **Introduction**	1							8hrs
	1.1. Information System Design		√			√	1hr	2hrs	3hrs
	1.2. Basic concepts IS &R		√			√	1hr	2hrs	3hrs
	1.3. Challenges of IR Systems		√			√	1hr	1hr	3hrs
	2. Information retrieval models	2							15hr
	2.1. Boolean model and Boolean operations		√				1hr	2hrss	3hrs
	2.2. Vector model and similarity measure		√				1hr	2hrs	3hrs
	2.3. Review of probabilistic,		√				1hr	2hrs	3hrs

	2.4. Fuzzy set and extended Boolean models		√				1hr	2hrs	3hrs
	2.5. Other models and aspects of matching.		√				1hr	2hrs	3hrs
	3. Retrieval performance evaluation	4,5							10hrs
	3.1. Recall, precision and others		√		√		3 hr	4hrs	7hr
	3.2. . Reference collection		√		√		1hr	2hrs	3hr
	4. Query languages	3			√	√			6hrs
	4.1. Pattern matching				√	√	1 hr	2hrs	3hrs
	4.2. Structural queries				√	√	1hr	2hrs	3hrs
	5. Query operations	3							9hrs
	5.1. . Relevance feedback				√	√	2hr	2hrs	4 hrs
	5.2. Local and global analysis				√	√	2 hr	3hrs	5hrs
	6. Text and multimedia languages	3							6hrs
	6.1. Information theory				√	√	1hr	2hrs	3 hrs
	6.2. Natural language modeling: Zipf's and Heaps's laws				√	√	1hr	2hrs	3 hrs
	7. Text Operations	5							8hrs
	7.1. Document clustering				√	√	1hr	3hrs	4hrs
	7.2. Text compression: Huffman coding				√	√	21hr	3hrs	4hrs

8. Indexing and searching	5							7hrs
8.1. Inverted and non-inverted files				√	√	1.5hrs	2hrs	3.5hrs
8.2. Sequential searching				√	√	1.5hrs	2hrs	3.5hrs
9. User interfaces and visualizations	1,2,3,5,6							7hrs
9.1. Introduction						30 minutes	1hr	1:3 hrs
9.2. The information access process						30 minutes	1hr	1:3hrs
9.3. Context and query specification						1hr	1hr	2hrs
9.4. Using relevance judgment and interface support for the search process						1 hr	1hr	2hrs
10. Searching the Web	6							7hrs
10.1. Search engines		√		√		1hr	2hrs	3hrs
10.2. Browsing		√		√		1hr	3hrs	4hrs
Total								83hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	10%			4hrs
2	Quiz	10%			3hrs

	3	Project	10%`			10hrs
	4	Others	Attend.& part. (5%)			1hr
		Tests	(5%)			3hrs
	5	Others	Mid Exam (20%)			6hrs
					Total	hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%			10
					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	Software			
		2	Computer Lab			
		3				
		4				
		5				
13	Text book and reference: (note: ensure the latest edition /publication)	1	Ricardo Baeza-Yates, Berthier Riberiro-Neto, "Modern Information Retrieval", 2nd Edition. Addison Wesley, 201 ISBN-10: 9780321416919. http://www.mir2ed.org/.			
		2	Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze." An Introduction to Information Retrieval Cambridge University Press Cambridge, England, 2007			

		3	Croft BW, Metzler D, Strohman T. Search Engines: Information Retrieval in Practice. 1st Edition. Boston: Pearso Education, Addison Wesley 2010. ISBN-10: 0136072240, ISBN-13: 978-0136072249.
		4	Ed Greengrass, "Information Retrieval: A Survey", 30 November 2000. Available at https://www.csee.umbc.edu/csee/research/cadip/readings/IR.report.120600.book.pdf https://www.mooc-list.com/course https://www.courseera.org

AdamaScience and Technology University						
1	School: ***Electrical Engineering and Computer Science***			Department: ***Computer Science Engineering***		
2	Course Category					
	Course Name	***Human-Computer Interaction (HCI)***				
	Course Code:	***SEng4304***				
3	Synopsis:					
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-					

	requisite: (if any)	
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Discuss the relationship between the cognitive principles and their application to interfaces and products.
	CLO2	Apply the conceptual terms for analyzing human interaction with products such as affordance, conceptual model, and feedback.
	CLO3	Analyze different user populations with regard to their abilities and characteristics for using both software and hardware products.
	CLO4	Define the importance of the user abilities and characteristics in the usability of products & Ergonomics
	CLO5	Develop Interactive computing system that’s affordable, simple &usable.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																	
														Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					Teaching Methods	Test	Quiz	Assignment	Project	Lab-report

													L	T	P	O					
CLO1	√												√		√			√	√		
CLO2		√											√		√						
CLO3						√							√		√	√	√		√		
CLO4					√								√		√			√	√		
CLO5							√						√		√		√			√	√

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)			
			Teaching and Learning Activities	Total (SLT)

	Course Content Outline	CLO	Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2	
			L	T	P	O			
	Chapter 1:**Introduction to Human Computer Interaction** 1.1. Introduction	1	√						10hrs
	1.2. Definition ,Goal	1							
	1.3. Historical background	1	√						
	Chapter 2: The Human	**2**	√		√				20hrs
	2.1.Input-output channels	2	√		√				
	2.2.Human Memory	2	√		√				
	2.3.Thinking: Reasoning , problem solving, skill & Error	2	√		√				
	2.4.Emotion	2	√		√				

	2.5.Individual difference	2	√		√				
	2.6.Psychology & the design of Interactive Computing	2	√		√				
	2.7.Summery	2	√						
	Chapter 3:The Computer	3	√						10hrs
	3.1.input device :positioning and pointing Technology	3	√						
	3.2.Output device	3	√						
	3.3.Virtual reality &3D interaction	4	√						
	3.4.Physical interaction , sensors & Special devices	3	√						
	3.5.Paper	4	√						
	3.6.Memory	4	√						
	3.7.Processing &Network	3	√						
	Chapter 4:Interaction	2	√						10hrs
	4.1. Introduction	2	√						
	4.2.Models of interaction	3	√						

	4.3.Ergonomics	3	√						
	4.4.Interaction styles	3	√						
	4.5.The context of the interactions	3	√						
	4.6. Paradigms for interaction	2	√						
	Chapter 5:Interaction Design	4	√						10hrs
	5.1.What is design?	1	√						
	5.2.User focus	3	√						
	5.3.Scenarios	3	v						
	5.4. Navigation design	3	√						
	5.5. Screen design and layout	4	√						
	5.6.Interaction and prototyping	4	√						
	Chapter 6: Design Rules and Implementation support	3	√						10hrs
	6.1. Introduction	2	√						
	6.2.Principles to support usability	2	√						
	6.3.Standards	5	√						
	6.4.Guidelines	5	√						
	6.5.Golden rules and heuristics	4	√						
	6.6.HCI patterns	3	√						

	6.2.**Implementation Support**	3	√						
	6.2.1. **Introduction**	3	√						
	6.2.2. Elements of windowing systems	3	√						
	6.2.3. Programming the application	2	√						
	6.2.4. User interface management systems	2	√						
	Chapter 7: Evaluation Techniques and Universal Design	5							10hrs
	7.1.Evaluation Techniques	5	√						
	7.1.1. What is evaluation?	1	√						
	7.1.2. Goals of evaluation	2	√						
	7.1.3. Choosing an evaluation method	2	√						
	7.2. Universal Design	2	√						
	7.2.1. Introduction	1	√						
	7.2.2. Universal design principles	2	√						
	7.2.3. Multi-modal interaction	3	√						
	7.2.4. Designing for diversity	4	√						
	Total								80hrs
	Assessment								

	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
		1. Assignments I	10	2	1	3hrs
		2. Quiz 1	10	2	1	3hrs
		3. Test 1	10	2	1	3hrs
		4. Project	15	6	2	8hrs
	5	5. Lab Assessments	15	5	5	10hrs
	Total					27hrs
	Final Exam		Percentage (%)	F2F	NF2F	SLT
			40%	3 hrs	10hrs	13hrs
					Grand Total SLT	100%
	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.					
1 2	Special requirements and resources to deliver the	1	Software			
		2	Computer Lab			

	course (e.g. software, computer lab, simulation room …etc.)	3	Choose an item.
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	Dix, A., Finlay, J., Abowd, G. and Beale, R. (1997). Human-computer interaction
		2	G. Abowd. Agents: recognition and interaction models. In D. Diaper, D. Gilmore, G. Cockton and B. Shackel, editors, Human–Computer Interaction – Proceedings INTERACT'90, pages 143–6. North-Holland, Amsterdam, 1990

Adama Science and Technology University		
1	School: ***SoEEC***	Department: ***Computer Science and Engineering***
2	Course Category	***Core Elective/focused Area Module***
	Course Name	***Introduction to Natural Language Processing***
	Course Code:	***SEng5303***
3	Synopsis:	The course teaches to deal with the automated storage and retrieval of documents, computer scientists need to use the concept called information retrieval (IR). Information Retrieval systems are deployed in university, company, and also libraries or any fields that depends on documents to do its work can benefit from Information Retrieval techniques. The goal of this course is aimed to analyze the advanced data structures, file structure databases. Concepts of key decoding by tree and Ranking techniques as well as Document retrieval and question and answering systems will also be discussed in the class. Furthermore, algorithms and techniques for automatic classification and storage of documents and algorithms of Information Retrieval must be instructed in the class. Relevant empirical studies which compare algorithms and data structures are also included.

4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	1. Discrete mathematics, 2. Good knowledge of programming, data structures, and algorithms, 3. Basic knowledge of probability theory and optimization.				

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Explain approaches to syntax and semantics in NLP.
	CLO2	Demonstrate the fundamental mathematical models and algorithms in the field of NLP.
	CLO3	Explain the complexity of speech and the challenges facing speech engineers.
	CLO4	Discuss machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, etc.
	CLO5	Practice the skills (experience) of solving specific NLP tasks, which may involve programming in Python or R, as well as running experiments on textual data.

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods	Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8						Test	Assi	Proj	Lab-	Fina l Exa

														L	T	P	O					
	CLO1	√												√			√	√	√			√
	CLO2		√		√															√		√
	CLO3			√														√	√			√
	CLO4						√											√	√		√	√
	CLO5					√			√									√	√	√	√	√
	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	It will enhance students existing Programming skills with the addition of natural language processing and speech recognition techniques. These skills can be used in various applications such as part of speech tagging and machine translation, among others.
	2	Students will develop the skills that they need to start applying natural language processing techniques to real-world challenges and applications.
	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:**Introduction to natural language processing** 1.1Introduction		1						8hrs + 2hrs

	1.2 Structural features of texts in natural language; ambiguity on all levels of language;		1						
	1.3 The main challenges of natural language processing;		1						
	1.4 Basic approaches to problem solving: manually written rules and machine learning		1		1				
	Chapter 2:Basic text processing and edit distance 2.1Preprocessing: tokenization and segmentation;		1		1				8hrs + 8hrs
	2.2Normalization of words: stemming, lemmatization,		1		1				
	2.3Morphological analyzers; regular expressions;		1		1				
	2.4Edit distance.		1		1				
	Chapter 3Language models 3.1N-grams; perplexity; methods of smoothing;		2		1				12hrs + 8hrs
	3.2The use of language models: input		2		1				

	prediction, error correction,								
	3.3 Speech recognition, text generation.		2		2				
	Chapter 4:**Tagging problems and hidden Markov models** 4.1POS tagging,		1		1				8hrs + 8hrs
	4.2Named entity recognition as a tagging problem,		1		1				
	4.3 Hidden Markov models, their advantages and disadvantages,		1		1				
	4.4 The Viterbi algorithm		1		1				
	Chapter 5:Text classification and sentiment analysis 5.1Classification problems, Naive Bayes classifier,		2		2				8hrs + 8hrs
	5.2Text classification, Sentiment analysis.		2		2				
	Chapter 6:**Modeling** 6.1Learn about the main uses of Machine learning models in NLP.		2		2				8hrs + 8hrs
	6.2 Learn about machine translation and sentiment analysis.		2		2				

Total		26		21				94

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)		√	
2	Assignments	Assignment I (10%)		√	
3	Project	10%		√	
4	Others	Mid Exam (20%)	√		
5	Lab-report	10%	√		
				Total	60%

Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
Final Exam	40%	√		
			Grand Total SLT	100%

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.
		5	Choose an item.
13	Text book and reference:	1	Dan Jurafsky and James H. Martin, Speech and Language processing, 2nd Addition, Prentice

	(note: ensure the latest edition /publication)		Hall, 2008 Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit (O'Reilly 2009, website 2018) http://www.nltk.org/book/ Dipanjan Sarkar, Text Analytics with Python (Apress/Springer, 2016) https://link-springer-com.proxy.uchicago.edu/book/10.1007%2F978-1-4842-2388-8
		2	https://ocw.mit.edu
			https://onlinecourses.nptel.ac.in

AdamaScience and Technology University		
1	School: ***School of Electrical Engineering and Computing***	Department: ***Computer Science and Engineering***
2	Course Category	***Core Module***
	Course Name	***Introduction to Computer Vision and Image Processing***
	Course Code:	***SEng5301***
3	Synopsis:	This course provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks.

		We will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition. We will develop the intuitions and mathematics of the methods in class, and then learn about the difference between theory and practice in projects.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:		Year:		
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	▪ Describe both the theoretical and practical aspects of computing with images;				
	CLO2	▪ Discuss the foundation of image formation, measurement, and analysis;				
	CLO3	▪ Apply common methods for robust image matching and alignment;				
	CLO4	▪ Implement object and scene recognition and categorization from images;				
	CLO5	▪ Developed computer vision applications				

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1	√												√		√				√		
CLO2		√											√		√		√	√			√
CLO3			√										√		√				√		√
CLO4				√									√		√		√				√
CLO5				√									√		√					√	√

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	Problems Solving Skills
2	Research

	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: Image Formation and Filtering Introduction to Computer Vision Image Filtering Thinking in Frequency	CLO1&3	√		√				10hrs
	Chapter 2: Feature Detection and Matching 2.1. Edge Detection 2.2. Interest Points and Corners Local Image Features and Feature Matching	CLO1 &4	√		√				15 hrs

	2.3. Light and Color								
	Chapter 3: Machine Learning 3.1. Machine Learning: Unsupervised Learning 3.2. Machine Learning: Supervised Learning	CLO3&4	√		√				20 hrs
	Chapter 4: Recognition 4.1. Recognition, Bag of Features, and Large-scale Instance Recognition 4.2. Large-scale Scene Recognition and Advanced Feature Encoding 4.3. Detection with Sliding Windows: Dalal Triggs and Viola Jones 4.4. Descriptor Failure and Big Data	CLO1&3		√		√			15 hrs
	Chapter 5: Deep Learning 5.1. Neural Networks and Convolutional	CLO3&4	√		√				10hrs

	Neural Networks 5.2. Training Neural Networks								
	Chapter 6: Computer Vision and Society 6.1. Social Good and Dataset Bias	CLO3& 4	√		√				150hrs
	Total							80 hrs	

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (5%)	1	1	2hrs
2	Assignments	Assignment II Lab (10%)	1	1	2hrs
3	Project	Mini Project (10%)	2	6	8hrs
4	Others	Mid Exam (25%)	3	8	11hrs
5	Quize	Quiz (10%)	2		2
				Total	25 hrs

	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	3hrs	12hrs	15hrs
					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	Computer Lab			
		2	Software			
		3	Choose an item.			
		4	Choose an item.			
		5	Choose an item.			
13	Text book and reference: (note: ensure the latest edition /publication)	1	Computer Vision: Algorithms and Applications, 2nd ed. by Richard Szeliski.			
		2	Concise Computer Vision by Reinhard Klette			

<table>
<tr><td colspan="7">AdamaScience and Technology University</td></tr>
<tr><td>1</td><td colspan="3">School: Electrical Engineering and Computing</td><td colspan="3">Department: Computer Science and Engineering</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">Implementation of Modern Operating System</td></tr>
<tr><td>Course Code:</td><td colspan="5">SEng3304</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">This course focusesexplore fundamental component of operating systems such as process scheduling, memory management, device drivers, file systems, network communication management and understand every detail of OS kernel by: solving hard design problems; implementing a kernel-level programming; debugging challenging run-time model violations due to concurrency.</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></td><td>Year:</td><td></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">Fundamentals of Software Engineering</td></tr>
<tr><td rowspan="2">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">▪ Explain the basic concept of design and architecture of operating system</td></tr>
</table>

	CLO2	▪ Explain the interactions of input/output operations and per-thread scheduling states;
	CLO3	▪ Describe and illustrate key elements of higher-level operating systems features such as file Systems, Synchronization, systems and memory management.
	CLO4	▪ Understand the high-level structure of the Linux kernel both in concept and source code.
	CLO5	▪ Define, restate, discuss, and explain memory management and process modeling.
	CLO6	▪ Understanding the basic concept of quantum computer and operating system.
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods				Assessment					
													L	T	P	O	Test	Quiz	Mid Exam	Assignment	Project	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 (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						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			

	Chapter 1: Introduction to Design and Implementation of OS 1.1 Design Goals: User Goals and System Goals 1.2 TDD (Test-Driven Design), BDD (Behavior-Driven Design), and all that 1.3 OS Structure: Monolithic, Microkernel, Exokernel, Multikernel 1.4 OS Structure: Modern Architecture	1	4					4	8hrs
	Chapter 2: Parallelism and Synchronization 2.1 Synchronization and Scheduling Review 2.2 Synchronization Approaches 2.3 Real-Time Scheduling 2.4 levels of Scheduling	3	4					6	10

	Chapter 3:**Process Modeling and Simulation** 3.1. Process Model 3.2. Control block 3.3. Process Execution 3.4 Process optimization	5	4					4	8hrs
	Chapter 4: Memory Management 4.1 Memory Management 4.2 Uni programing 4.3 Multi programming 4.4 Relocation 4.5 Memory Allocation	5	4					6	10hrs

	Chapter 5: Device Driversand File Systems 5.1.Device Driver Structure 5.2. Layers of Abstraction in File Systems 5.3. Design Choices for File and Directory Metadata 5.4 Buffer Cache and Memory-mapped Files 5.5 Secondary Storage Disks 5.6 Distributed File Systems 5.7 Communication and Data Transfer with I/O Devices	3	4					6	10hrs
	Chapter 6 kernel-level Programming 6.1 Kernel space and User space 6.2 System Call and interrupts 6.3 Portable Operating System Interface (POSIX) 6.4 The modular kernel 6.5Upgrading the kernel	4	4					5	9hrs

	Chapter 7: OS Security and Protection 7.1. Protection and Security Methods 7.2. System Calls 7.3. System Access Threats 7.4 Authentication **7.5** Access Control 7.6 File System Access Control 7.7 Operating Systems Hardening 7.8 Test the System Security 7.9 Data Backup and Archive	4	4					5	9hrs
	Chapter 8: Quantum computer and Operating Systems 7.1. introduction to Quantum computer and operation system 7.2. The Swarm, Extreme Distributed Storage and Quantum Computing	6	4					5	9hrs
	Total		32					41	73

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)		5	5
2	Assignments	Assignment II (10%)		7	7
3	Project	15%		12	12
4	Others	Mid Exam (25%)	2	8	10
5	Choose an item.				
				Total	34
Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
Final Exam		40%		13	13
				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 and reference:	1	Tanenbaum, *Modern Operating Systems* (background) .
		2	Mukesh Singhal and Niranjan Shivaratri, *Advanced Concepts in Operating Systems* .

Adama Science and Technology University			
1	School: ***SOEEC***		Department: ***CSE Choose an item.***
2	Course Category	***Major Mandatory***	
	Course Name	***Compiler Design***	
	Course Code:	***SEng3306***	
3	Synopsis:	This course describes the basic techniques and tool required to construct a compiler. The two parts of compilation: analysis and synthesis will be introduced and discussed. In the analysis part, will learn how to break the source program in to constitute pieces and create an intermediate representation of the source program. In the synthesis part, we will construct a target program from	

		the intermediate representation. Moreover, widely used construction tools (Lex and Yacc) will be explained. Examine the generic issue in the design of code generator				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	4	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	CSE 4201				

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

CLO1	Discuss about the phases of compilation, structures of compilers and compiler construction tools.
CLO2	Demonstrate the generation of lexical analyzer (scanner) using lexical analyzer generator tool.
CLO3	Use formal grammars to specify syntax of languages and declarative tools to generate parsers.
CLO4	Implement context-sensitive, source-level static analyses such as type-checkers or resolving identifiers to identify their binding occurrences.
CLO5	Explain the use of metadata in run-time representations of objects and activation records, such as class pointers, array lengths, return addresses, and frame pointers.
CLO6	Generate the low-level code for calling functions/methods in modern languages.

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)								Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√								√		√		√	✓	√		✓

	CLO2		√							√		√			✓			✓
	CLO3				√					√		√		√	✓			✓
	CLO4		√							√		√				√		✓
	CLO5				√					√		√		√			√	✓
	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	Research and solution development
	2	Problem Solving skills
	3…etc.	Communication 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 1.1 Introduction to compilers, Language Processors, regular expressions, NFA, DFA, PDA, language types 1.2 The Structure of a Compiler CFL and its applications in compiler design 1.3 Phases of compilation, symbol tables, preprocessor, interpreter, assembler, linkers and	1	3						3hrs

	loaders. 1.4 Compiler Construction Tools								
	Chapter 2: Lexical Analysis 2.1 Tokens, Patterns, and Lexemes, Attributes for Tokens 2.2 Lexical Errors, Input Buffering, Specification of Tokens, Recognition of Tokens 2.3 Design of lexical analyzers using DFA, State Minimization in Lexical Analyzers, optimization.	2	4		6			1	11hrs
	Chapter 3: Syntax Analysis 3.1 Introduction to the syntax analysis, Derivations, ambiguity, elimination of ambiguity 3.2 Left recursion, left factoring, top-down and bottom up parsing. 3.3 Parser design methodologies and tools. Design and use of parsing tables, parser generators 3.4 Top-Down Parsing: recursive descent algorithm 3.4.1 First and Follow sets, LL(1) grammars, predictive parsing 3.5 Bottom-Up Parsing: Reductions, Handle Pruning 3.5.1 Shift-Reduce Parsing, Conflicts During Shift-Reduce Parsing 3.5.2 Simple LR, LR (1), SLR (1), design of parsing tables, parser generator etc. 3.5.3 CLR (1) and LALR (1) grammars	3	9		12		2	2	25hrs

	Chapter 4: Semantic analysis: Syntax Directed Translation and Type Checking 4.1 Semantic analysis, difference between lexical, syntax and semantic analysis, Type Checking etc.	4	4		6		1	1	12 hrs
	4.2 Syntax Directed Translation Dependency Graphs, Ordering the Evaluation of Attributes 4.2.1 Syntax-Directed Definitions 4.2.2 Construction of Syntax Trees 4.2.3 Syntax-Directed Translation Schemes 4.3 Type Checking 4.3.1 Type Systems 4.3.2 Type Conversions								
	Chapter 5: Intermediate-Code Generation Variants of Syntax Trees, DAG, Three-Address Code, Translation of Expressions, Control Flow, Back patching	6	4		6		1	1	12 hrs
	Chapter 6: **Run Time Environments** Stack Allocation of Space: Activation Trees, Activation Records, Access to Nonlocal Data on the Stack. Introduction to Garbage Collection: Reachability, Reference Counting Garbage Collectors	5	2		6		1	1	10 hrs
	Chapter 7:**Introduction to Code** Optimization 7.1 Code Generation – Simple code generator 7.2 Register Allocation 7.3 DAG Representation 7.4 Peephole Optimization Techniques	6	4		6			1	15hrs

	Total		30		42				88hrs

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)	1	3	4hrs
	2	Assignments	Assignment I (10%)	1	3	4hrs
	3	Project	10%	1	4	5hrs
	4	Others	Mid Exam (30%)	2	4	6hrs
	5	Choose an item.				
	Total					19hrs

	Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam	40%	3	10	13hrs
	Grand Total SLT				32hrs

	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	A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, Compilers: Principles, Techniques, and Tools, Pearson Education, 2007 (second ed.).
		2	K.D. Cooper, and L. Torczon, Engineering a Compiler, Elsevier, 2004. Y.N. Srikant and Priti Shankar The Compiler Design Handbook: Optimizations and Machine Code Generation, Second Edition

AdamaScience and Technology University		
1	School: ***Electrical Engineering and Computing***	Department: ***Computer Science and Engineering***
2	Course Category	***Major Elective***
	Course Name	***Introduction to Machine Learning***
	Course Code:	***SEng5305***
3	Synopsis:	Machine learning usesinterdisciplinary techniquessuch as statistics, linear algebra, optimization, and computer science to create automated systems thatcan sift through large volumes of data at high speed to make predictions or decisions without human intervention.Machine learning as a field is now incredibly pervasive, with applications spanning frombusiness intelligenceto homeland security, from analyzing biochemical interactions to structural monitoring of aging bridges, and from emissions to astrophysics, etc. This class will familiarize studentswith a broad cross-section of models and algorithms for machine learning, and prepare studentsfor research or industry application of machine learning techniques.
4	Name(s) of	

	Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	4	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)					
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO 1	Identify the various components/subsystems machine learning concepts				
	CLO 2	Understand a wide variety of machine learning algorithms.				
	CLO 3	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models				
	CLO 4	Determine the computational complexity associated with development and execution of learning algorithms for a given data set.				
	CLO 5	Solve real worlds problem using machine learning tools , realistic data set				

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8			Teaching Methods				Assessment						
											L	T	P	O	Test	Quiz	Assignment	Mid Exam	Lab-Report	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	Machine learning algorithms								
	2	Skills of research on new paradigms								
	3	----								
11	Distribution of Student Learning Time (SLT)									
	Course Content Outline	CLO	Teaching and Learning Activities							Total (SLT)
			Guided learning (F2F)				Guided Learning (F2F)	Independent Learning (NF2F)		
			L	T	P	O				
	1. **Introduction**	1								8hrs
	what is ML; Problems, data, and tool		√			√	1hr	2hrs		3hrs
	Types of machine learning		√			√	1hr	2hrs		3hrs

	Linear regression; SSE; gradient descent; closed form; normal equations; features, Overfitting and complexity; training, validation, test data,		√			√	1hr	1hr	3hrs
	Classification problems; decision boundaries; nearest neighbor methods	2	√			√	5hrs	10hrs	15hr
	Probability and classification, Bayes optimal decisions	2	√				1hr	2hrs	3hrs
	Naive Bayes and Gaussian class-conditional distribution	3							10hrs
	Linear classifiers, Bayes' Rule and Naive Bayes Mode	3	√		√	√			6hrs
	Logistic regression, online gradient descent, Neural Networks, Decision tree	4	√		√	√	1 hr	2hrs	3hrs
	Ensemble methods: Bagging, random forests, boosting	4	√		√	√	1hr	2hrs	3hrs

	A more detailed discussion on Decision Tree and Boosting								
	Unsupervised learning: clustering, k-means, hierarchical agglomeration	5							9hrs
	Advanced discussion on clustering and EM	5			√	√	2hr	2hrs	4 hrs
	Support vector machines and large-margin classifiers, Time series; Markov models; autoregressive models				√	√	2 hr	3hrs	5hrs
	Total								83hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	10%			4hrs
2	Quiz	10%			3hrs
3	Project	15%`			10hrs

	4	Tests	(5%)			3hrs
	5	Others	Mid Exam (20%)			6hrs
					Total	27hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%			10
					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	Software
		2	Computer Lab
		3	
		4	
		5	
1	Text book and	1	Machine Learning: An Algorithmic Perspective (Second Edition) by Stephen Marsland, CRC

3	reference: (note: ensure the latest edition /publication)		Press, 2015.

	AdamaScience and Technology University		
1	School: ***SOEEC***		Department: ***Computer Science and Engineering***
2	Course Category		
	Course Name	***Introduction to Big Data Analytics***	
	Course Code:	***SEng5302***	
3	Synopsis:	The course starts with Big Data basics and foundations, then move to Big Data Platforms and Data Storage Solutions. It discusses different types of Big Data analytics algorithms that are commonly used to process and manipulate huge size of data (Big Data).It also includes Cloud Platforms Solutions available in the current market like such as: Amazon Web Services (AWS), Google Cloud Platform, Microsoft Azure, IBM Bluemix, Pivotal Cloud Foundry, Yahoo Cloud Platform etc. In addition, It teaches fundamental techniques of streaming Big Data processing. The course also covers how to design and implement software systems that manage and organization large size data. Finally, Dig data visualization techniques, and tools will be discussed.	
4	Name(s) of		

	Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Data Structures and Algorithms				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	▪ Describe the basic characteristics and types of Big Data solutions				
	CLO2	▪ Design Data-driven decision-making applications using conceptual frameworks designed for massively parallel computing infrastructure.				
	CLO3	▪ Analyze hidden patterns in large data sets and propose robust algorithms for big data processing tasks.				
	CLO4	▪ Combine existing solutions with scalable computing and storage infrastructures and provide cost effective industrial solution to big data processing and analysis task.				
	CLO5	▪ Identify the shortcomings of existing big data platform and propose improvements in the design of the tools and techniques.				
	CLO6	▪ Compare various big data products and recommend the best platform and tools based on their Functionality, Security and Privacy Issues.				
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:					

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				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					√	√							√		√					√	

<table>
<tr><td></td><td colspan="2">Indicate the relevancy between the CLO and PO by ticking “√”on the appropriate relevant box</td></tr>
<tr><td rowspan="4">10</td><td colspan="2">Transferable Skills (if applicable)

(Skills learned in the course of study which can be useful and utilized in other settings)</td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3…etc.</td><td></td></tr>
<tr><td>11</td><td colspan="2">Distribution of Student Learning Time (SLT)</td></tr>
</table>

<table>
<tr><td rowspan="3">Course Content Outline</td><td rowspan="3">CLO</td><td colspan="6">Teaching and Learning Activities</td><td rowspan="2">Total (SLT)</td></tr>
<tr><td colspan="4">Guided learning (F2F)</td><td>Guided Learning (NF2F)</td><td>Independent Learning (NF2F)</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>O</td><td></td><td></td><td></td></tr>
</table>

	Chapter 1:Introduction of Big Data Analytics 1.1 Definitions, Software and Tools for Massive **Big Data** Processing. 1.2 Security, Privacy Issues in Big Data. 1.3 Scalable Architectures for Massively Parallel Data Processing. 1.4 Data Mining Tools and Techniques for Big Data. 1.5 Scalable Storage Systems for Big Data. 1.6 Web and Social Networks	CLO 1					6	4	10

	Chapter 2:Big Data Platforms and Data Storage 2.1 Map-reduce and Big Data analyticsMap-reduce theory, Hadoop, Hive and Pig, Functional decomposition 2.2 Apache Spark, MS Azure, Claudera, HDFS 2.3 Cassandra, MongoDB, NoSQL databases	CLO1 CLO 2					10	5	15
	Chapter 3: Big Data Analytics Algorithms 3.1 Data Preprocessing in Big Data environment 3.2 Linear Regression on Big Data task 3.3 Classification, Clustering in big data environment 3.4 Other ML algorithms in context of Big data 3.5 Clustering Big Data	CLO 3 CLO 5					12	4	16

	Chapter 4: Linked Big data Analytics 4.1 Use of structured data in Big data environments 4.2 Applications of linked data structures in big data	CLO 4					8	3	11
	Chapter 5: Graph Database and Analytics 5.1 Use of graph database 5.2 Graph based fraud detection, 5.3 Social network analysis, 5.4 Recommendation engines etc.						6	3	9
	Chapter 6: Streaming Big Data Analytics 6.1 Google Cloud flow, 6.2 Apache kafka, 6.3 Apche storm, 6.4 Stream SQL, 6.5 Spark Streaming etc.	CLO 5 CLO6					10	6	16

Chapter 7: Big Data Visualization 7.1 Google Charts, 7.2 Tableau, Grafana, 7.3 Chartist, 7.4 FusionCharts, 7.5 Datawrapper, 7.6 Infogram, 7.7 ChartBlocks, and D3. js	CLO6	√ √				8	4	12
Total								89

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	-	2	2
2	Assignments	Assignment I (10%)	30 Minutes	2:30	3
3	Project	10%	30 Minutes	11:30	12
4	Others	Mid Exam (30%)	2	4	6
5	Choose an item.				

				Total	21
	Final Exam	Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam	40%	3	7	10
				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	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	Evan Stubbs, Big Data, Big Innovation: Enabling Competitive Differentiation through Business Analytics [1 ed.] Kuan-Ching LiKuan-Ching Li, Big data : algorithms, analytics, and applications Big data : algorithms, analytics, and applications Arshdeep Nahga, Vijay Madisetti, Big Data Science and Analytics: A Hands-on Approach,		

			2019. Nathan Marz. James Warren, Big Data Principles and best practices of scalable real-time data systems, Manning Publications, 2015. Eric Pimpker, Introduction to Data Visualization and Exploration with R, GeoSpatial Training Services, 2017 Martin Kleppmann, Designing Data-Intensive Applications, O'REILLY, 2017 Alex Gorelik, The Enterprise Big Data Lake, O'REILLY, 2019
		2	Prajapati V., Big data analytics with R and Hadoop Coursera MOOC's on Big Data Specialization

Adama Science and Technology University		
1	School: Choose an item.	Department: Choose an item.
2	Course Category	Core Elective/focused Area Module
	Course Name	***Computer Graphics***
	Course Code:	***SEng3303***
3	Synopsis:	Computer graphics is the art and science of communicating information using images that are generated and presented through computation. This requires (a) the design and construction of models that represent

		information in ways that support the creation and viewing of images, (b) the design of devices and techniques through which the person may interact with the model or the view, (c) the creation of techniques for rendering the model, and (d) the design of ways the images may be preserved. The goal of computer graphics is to engage the person's visual centers alongside other cognitive centers in understanding. Generally, this course deals with fundamental techniques in graphics, graphic systems, graphic communication, geometric modeling, rendering, and computer animation.					
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)		C^{++}				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:						
	CLO1	Explain how the limits of human perception affect choices about the digital representation of analog signals.					
	CLO2	Explain the concept of geometric, mathematical and algorithmic concepts necessary for generating the graphic primitives.					
	CLO3	Implement simple procedures that perform transformation and clipping operations on simple 2-dimensional images.					
	CLO4	Apply 3D coordinate system and the changes required to extend 2D transformation operations to handle transformations in 3D.					
	CLO5	Use common animation software to construct simple 2D/3D animation of a hypothetical scene.					
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:						

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8					Teaching Methods				Assessment				
														L	T	P	O	Test	Mid	Assignment	Project	Final
	CLO1	√												√			√		✓	√		✓
	CLO2		√											√		√		√	✓			✓
	CLO3	√												√		√			✓	√	√	✓
	CLO4				√									√		√		√		√		✓
	CLO5							√						√		√					√	✓
	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	It will be founding block for the advanced topics like Advanced computer graphics and Virtual reality.
	2	
	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:**Introduction To Computer Graphics** 1.1 Application areas of Computer Graphics 1.2 Overview of Graphics Systems - Video Display Devices - Raster Scan Systems - Random Scan Systems 1.3 Graphics Software		3				1	1	5hrs
	Chapter 2: **Output Primitives** 2.1 Line-Drawing Algorithms 2.2 Loading the Frame Buffer 2.3 Circle-Generation Algorithms 2.4 Ellipse-Generation Algorithms 2.5 Filled-Area Primitives 2.6 Character Generation 2.7 Attributes of Output Primitives		5		9		1	3	18hrs
	Chapter 3: **Two-Dimensional Transformations** 4.1 Basic Transformations – Translation, Rotation and Scaling 4.2 Matrix Representations and Homogeneous Coordinates 4.3 Composite Transformations 4.4 Transformations between Coordinate Systems 4.5 Two-Dimensional Viewing - The viewing pipeline		8		15		2	4	29hrs

	- Viewing Coordinate Reference Frame - Window-to-Viewport Coordinate Transformation 4.6 Clipping Operations - Point Clipping - Line Clipping - Polygon Clipping								
	Chapter 4: **Three-Dimensional Graphics** 4.1 Three-Dimensional Display Methods 4.2 Three-Dimensional Object Representation 4.3 Three-Dimensional Geometric and Modeling Transformations – Translation, Rotation, Scaling and others 4.4 Composite Transformations 4.5 Three-Dimensional Viewing - Viewing Pipeline - Viewing Coordinates - Projections - View Volumes and General Projection Transformations - Clipping		8		12		1	1	22hrs
	Chapter 5: **Computer Animation** 5.1 Design of Animation Sequences 5.2 Raster Animations 5.3 Computer-Animation Languages 5.4 Key-Frame Systems 5.5 Curve Generation and Simple Animations		4		6		2	2	14hrs

	using Transformations 5.6 Bezier Curve through N+1 control points 5.7 Render a scene and animate objects								
	Total		28		42				88hrs

	Assessment						
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)	1	2	3hrs
	2	Assignments	Assignment I (10%)	1	2	3hrs
	3	Project	10%	1	4	5hrs
	4	Others	Mid Exam (20%)	2	4	6hrs
	5	Lab-report	10%	1	1	2hrs
					Total	19hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	10	13hrs
					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	1	Computer Lab
		2	Software
		3	Choose an item.
		4	Choose an item.

	room …etc.)	5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	1. *Computer Graphics: Principles and Practice*, 3e, Hughes et al., Addison-Wesley, 2014. 2. P Shirley, *Fundamentals of Computer Graphics*, *2e*, AK Peters, 2005 3. Hearn and Baker *Computer Graphics* , *3e*, Prentice Hall, 2004. 4. Foley and Van Dam, *Fundamentals of Interactive Computer Graphics* 5. Moller and Haines, Real-time Rendering, AK Peters,
		2	https://ocw.**mit**.edu
			https://onlinecourses.nptel.ac.in

Adama Science and Technology University			
1	School: ***SoEECg***		Department: ***Computer Science And Engineering***
2	Course Category	***Major Electives***	
	Course Name	***Agile and Test Driven Development***	
	Course Code:	***SEng5304***	
3	Synopsis:	This course introduces the principles and practice of agile software development methodologies for small small to medium sized software projects. Through building a significant software system in a team, and reflecting critically on this experience, students will further their understanding of how the software engineering process used affects the development and delivery of software. The course will cover various agile methods which includes Scrum, extreme programming(XP), test driven development(TDD), Kanban… in this courses students	

		also apply agile methodologies like planning and estimation techniques by implementing software project.
4	Name(s) of Academic Staff:	
5	Semester and Year offered:	Semester: II | Year: 5 | Elective II
6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	SEng3204
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	• Describe basic concepts of Agile Software development.
	CLO2	• Discuss the Conceptual Foundations of Agile Development Methodologies and principles.
	CLO3	• Identify the Issues and Challenges related to Pair Programming and Architected Agile Solutions for Software-Reliant Systems
	CLO4	• Apply Agile Interaction Design and Test-Driven Development
	CLO5	• Develop software projects Using Agile methods and Principles
	CLO 6	• Use Agile planning and estimation
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods				Assessment				
															Test	Quiz	Assignment	Project	Lab-report
											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 (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Develop Analytical skills
	2	Inculcate Group/team working& goodWritten communication
	3…etc .	Project management and Oral communication

1 Distribution of Student Learning Time (SLT)

Course Content Outline	CLO	Teaching and Learning Activities						Total (SLT)
		Guided learning (F2F)				Guided Learning (F2F)	Independent Learning (NF2F)	
		L	T	P	O			
Chapter 1: Introduction 1.1 What Is Agile?	CLO1	2		3		6	2	6hrs

	1.2 Introduction to agile development methodologies, Principles and practices								
	Chapter 2: Understanding Agile Values and Principles 2.1 A Team Lead, Architect, and Project Manager Walk into a Bar... 2.2 Agile to the Rescue! (Right?) 2.3 A Fractured Perspective 2.4. The Agile Manifesto Helps Teams See the Purpose Behind Each Practice 2.5. Understanding the Elephant 2.6. Where to Start with a New Methodology	CLO2, CLO3	2		3		2	2	6hrs
	Chapter 3: Agile Planning and Estimation The Customer Is Always Right...Right? 1. Delivering the Project	CLO6	4		3			2	6hrs

	2. Communicating and Working Together 3. Project Execution — Moving the Project Along 4. Constantly Improving the Project and the Team 5. The Agile Project: Bringing All the Principles Together								
	Chapter 4: Scrum 4.1. introduction 4.2. Self-Organizing Teams 4.3. Scrum Planning and Collective Commitment 4.4. Scrum via a Detailed Project Example	CLO2, CLO6	4		3			2	
	Chapter 5: Extreme Programming (XP) 5.1. introduction 5.2. Values and Principles	CLO2	4		8			2	

	5.3. practices								
	Chapter 6: Kanban 6.1 What is Kanban 6.2 Kanban - Benefits 6.3 Kanban – Characteristics 6.4 Kanban – Project Management	CLO2	2		3			2	
	Chapter 7: Lean software development 7.1 What is Lean 7.2 Who Uses Lean? 7.3 Lean– Characteristics 7.4 Lean -Project Management	CLO2	2		3			2	
	Chapter 8: Agile Software development practices 8.1. Test Driven Development (TDD) 8.2. pair programming 8.3. acceptance test driven development	CLO4, CLO5	4		7			2	

	8.4. agile								
	Chapter 9: Enterprise Agility; Large-scale Agility	CLO6	2		6			2	
	Chapter 10: Current Issues, Trends and best Practices in Agile	CLO3	2		3			2	
	Total		28		42			20	90 hr

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (5%)	-	-	2 hrs
	2	Assignments	Assignment II (5%)	30 Minutes	2:00	2:30 hrs
	3	Quiz	Quiz- 10%	1 hr	-	1 hr
	4	Lab-report/Project	Project- Report -10%	30 Minutes	10:00	11 hrs
	5	Others	Mid Exam -30%	2:30	2:30	5 hrs
					Total	21:30 hrs

	Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam	40%	3:00	6:00	8:30 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.				

	Special requirements and resources to deliver the course (e.g. software, computer lab, simulation room …etc.)	1	Software
		2	Internet connected Computer Lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.
	Text book and reference: (note: ensure the latest edition /publication)	[1] Andrew Stellman, Jennifer Greene, Head First Agile: A Brain-Friendly Guide, O'Reilly Media, 2017 [2] Andrew Stellman & Jennifer Greene. Learning Agile, UNDERSTANDING SCRUM, XP, LEAN, AND KANBAN, First Edition. USA. O'Reilly Media, 2014 **Reference** [3] Agile Software Development. Current Research and Future Directions-Torgeir Dingsoyr·Tore Dyb a·Nils Brede Moe,springer,2010. [4] Agile Software Development.Principles,Patterns and Practices-Robert Cecil	

		Martin,Alan Adapt Series,Pearson Education Inc. [5] Succeeding with agile : software development using Scrum , Cohn, Mike, 1962- 9780321579362, 2 edition,Addison-Wesley,2010 [6] Test-driven development : by example, Beck, Kent. 9780321146533, Addison-Wesley. [7] User stories applied : for agile software development, Cohn, Mike, 1962- 9780321205681, Addison-Wesley.

Adama Science and Technology University						
1	School: ***SoEEC***			Department: ***CSE***		
2	Course Category	***Core Elective/focused Area Module***				
	Course Name	***Component based Software Development***				
	Course Code:	***SEng5306***				
3	Synopsis:	Instead of building monolithic systems from scratch, Component-based Software Development (CBD) aims to construct systems by assembling ready-made components, and thereby reduce production cost and time-to-market, whilst increasing software reuse. The cornerstone of a CBD approach is the underlying component model, which defines what components are and how they can be composed. In this course, we will study current component models and how they measure up to the goals of CBD.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	5	

<table>
<tr><td>6</td><td colspan="3">Credit Hour:</td><td colspan="14">3</td></tr>
<tr><td>7</td><td colspan="3">Prerequisite/ Co-requisite: (if any)</td><td colspan="14">Software Architecture and Design (SEng3204)</td></tr>
<tr><td rowspan="5">8</td><td colspan="17">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="16">Explain what component-based software engineering is and how it is used to develop software</td></tr>
<tr><td>CLO2</td><td colspan="16">Identify and use different technologies and tools for developing component-based solutions</td></tr>
<tr><td>CLO3</td><td colspan="16">Analyze, and evaluate different type component-based software development models</td></tr>
<tr><td>CLO4</td><td colspan="16">Apply a given CBD approach to the construction of a real software system.</td></tr>
<tr><td rowspan="4">9</td><td colspan="17">Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:</td></tr>
<tr><td rowspan="3">Course Learning Outcomes (CLO)</td><td colspan="16">Program Learning Outcomes (PO)</td></tr>
<tr><td rowspan="2">PO1</td><td rowspan="2">PO2</td><td rowspan="2">PO3</td><td rowspan="2">PO4</td><td rowspan="2">PO5</td><td rowspan="2">PO6</td><td rowspan="2">PO7</td><td rowspan="2">PO8</td><td rowspan="2">P09</td><td rowspan="2">Teaching Methods</td><td colspan="5">Assessment</td></tr>
<tr><td>Test</td><td>Quiz</td><td>Assignment</td><td>Project</td><td>Lab-report</td></tr>
</table>

											L	T	P	O					
	CLO1									√	√						√		
	CLO2									√	√					√			
	CLO3									√	√							√	
	CLO4								√		√						√		
	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	Teaching and Learning Activities			Total (SLT)
			Guided learning (F2F)	Guided	Independent Learning	

							Learning (NF2F)	(NF2F)	
			L	T	P	O			
	Chapter 1: Basic concepts Component based Software Development 1.1 Definition 1.2 Components 1.3 Composition 1.4 Component models 1.5 Component-Based Software Development	1	2					9	11hrs
	Chapter 2: Survey of Current Component Models Measurement 2.1 Categories based on components 2.2 Categories based on composition mechanisms	3	4					10	14hrs
	Chapter 3: Software Component Design 3.1 Software Components and the UML 3.2 Component infrastructures: Business	1	4					12	16hrs

	Components, Components and Connectors 3.3 Designing Models of Modularity and Integration. 3.4 Software Architecture, and Design Principles							
	Chapter 4: Component-Based Software Systems Management 4.1 Measurement and Metrics for Software Components 4.2 Reuse Program for Software Components, 4.3 Software Component Project Management 4.4 Testing Components 4.5 Configuration Management and Component Libraries 4.6 The Evolution, Maintenance, and Management of CBS	4	6					12	18hrs
	Chapter 5:Component Technologies and tools 5.1 Overview of the CORBA Component Model,	2	4					12	15hrs

	5.2 Transactional COM+ 5.3 The Enterprise JavaBeans Component Model 5.4 Next Generation Software Components								
	Total		20					55	75

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)		7	7
2	Assignments	Assignment I (10%)		6	6
3	Project	10%	30 min	10	10:30
4	Others	Mid Exam (30%)	2:30	6	8:30
5	Choose an item.				32
				Total	
Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
Final Exam		40%	3	10	13

	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 Java, COM, DCOM, EJB and ,CORBA
		2	Simulation Room
		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 component-based software development, Lau, K.-K. (Kung-Kiu), World Scientific,2017.
		2	Component Software, Szyperski, Clemens, ACM,2002.
		3	Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, Wiley India

<table>
<tr><td colspan="7">AdamaScience and Technology University</td></tr>
<tr><td>1</td><td colspan="3">School: SoEEC</td><td colspan="3">Department: Computer Science and Engineering</td></tr>
<tr><td rowspan="3">2</td><td>Course Category</td><td colspan="5">Core Elective/focused Area Module</td></tr>
<tr><td>Course Name</td><td colspan="5">Advanced Networking</td></tr>
<tr><td>Course Code:</td><td colspan="5">SEng3308</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">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.</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>5</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">1. Discrete mathematics,
2. Good knowledge of programming, data structures, and algorithms,
3. Basic knowledge of probability theory and optimization.</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 do:</td></tr>
</table>

	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 switching (MPLS) improve 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:	

Course Learning	Program Learning Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods	Assessment				
											Test/	Assig	Proje	Lab-	Final Exam

											L	T	P	O					
	CLO1	√									√			√	√	√			√
	CLO2		√		√												√		√
	CLO3			√											√	√			√
	CLO4						√								√	√		√	√
	CLO5					√			√						√	√	√	√	√
	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	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (NF2F)	Independent Learning (NF2F)	
			L	T	P	O			

	Chapter 1:**Introduction** 1.1 Internet Applications	1	2 20m		3		3	2	10hrs
	1.2 Network Requirements		20m						
	1.3 Network Architecture		20m						
	1.4Network Programming Interface		20m						
	1.5 Network Performance		30m						
	Chapter 2: **The Link Layer and LANS**	2	4		6		5	5	20hrs
	2.1 Bit Encoding		30m						
	2.2 Bit Framing		30m						
	2.3 Error Detection and Correction		30m						
	2.4 Multiple Access Links and Protocols		30m						
	2.5 Wireless Networks		1		3				
	2.6 Switched Local Area Networks		1		3				
	Chapter 3:**Advanced Internetworking**	3	4		6		5	5	20hrs
	3.1 The Network Layer Control Plane and Data Plane		40m		1				
	3.2 SDN		40m		1				

	3.3 IPv6		40m		1				
	3.4 Multicast		40m		1				
	3.5 Multiprotocol Label Switching (MPLS)		40m		1				
	3.6 Routing in Mobile Devices		40m		1				
	Chapter 4: **Transport**	4	4		6		5	5	20hrs
	4.1 Simple Demultiplexor(UDP)		1		1				
	4.2 Reliable Byte Stream(TCP)		1		1				
	4.3 Remote Procedure Call		1		2				
	4.4 Real Time Transport (RTP)		1		2				
	Chapter 5: **Congestion Control and Resource Allocation**	5	4		6		5	5	20hrs
	5.1 Issues in Resource Allocation		48m		1				
	5.2 Queuing Disciplines		48m		1				
	5.3 TCP Congestion Control		48m		1				
	5.4 Advanced Congestion Control		48m		1				
	5.5 Quality of Service		48m		2				

	Chapter 6: **Network Security**	6	6		7		7	8	30hrs
	6.1 Principles of Cryptography		45m						
	6.2 Message Integrity and Digital Signatures		45m		1				
	6.3 End-point Authentication		45m		1				
	6.4 Securing E-Mail		45m		1				
	6.5 Securing TCP Connection : SSL		45m		1				
	6.6 Network-Layer Security: IPSec and Virtual Private Networks		45m		2				
	6.7 Securing Wireless LANs		45m		2				
	6.8 Operational Security: Firewalls and Intrusion Detection Systems		45m		2				
	Total		24		36		30	30	120hrs

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignments (six) (10%)		30	30hrs
	2	Lab Reports in Groups	12 Lap Reports (15%)	36		36hrs

	3	Project (Group Based)	15%		15	15hrs
	4	Exam	Mid Exam (20%)	3		3hrs
	5	Exam	Final Exam (35%)	3		3hrs
					Total	87hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	√		
					Grand Total SLT	100%

	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: Wireshark, Mininet, NS3, GNS3
		3	Visit: Ethip Telecom
		4	Choose an item.
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	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

Adama Science and Technology University						
1	School: Choose an item. ***SoEEC***		Department: Choose an item. ***CSE program***			
2	Course Category	Core Module				
	Course Name	***Distributed Software Systems***				
	Course Code:	***SEng4305***				
3	Synopsis:	This course introduces students to the principles, design, and implementation of distributed systems. The Lectures focus primarily on the principles and design of distributed systems, and cover communication, Processes, naming, synchronization, Consistency and Replication, and fault tolerance. A course project exposes students to the implementation aspects of distributed systems and serves to solidify students' understanding of the course material.				
4	Name(s) of Academic Staff:	Dr. Ravindra Babu Associate Professor				
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	CSE3222 Data Communication and Computer Networks CSEg4201				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Explain what a distributed system is, and what the desired properties of such systems are.				
	CLO2	Discuss the basic theoretical concepts of distributed systems.				
	CLO3	Examine how modern distributed systems meet the demands of contemporary distributed applications.				

	CLO4	Apply distributed algorithms for synchronization and concurrency, coordination, transactions, and replication
	CLO5	Employ fundamental distributed algorithms to solve problems that arise while designing systems using emerging distributed systems tools and technologies.

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Teaching Methods				Assessment				
									L	T	P	O	Test	Mid	Assignment	Project	Final
CLO1	√								√		√	√	√	✓	√		✓
CLO2	√								√		√		√	✓		√	✓
CLO3				√					√		√		√	✓	√		✓
CLO4			√						√		√		√		√		✓
CLO5				√					√	√					√	√	✓

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	Research and solutions development
2	Problem Solving Skills
3	Communication skills

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 1:**Introduction to distributed system:** 1.1Definition	1	6					2	8hrs
	1.2 Characteristics, organization and goals of distributed systems								
	1.3Pros and Cons of DSS								
	1.4Hardware and software concepts the client-server model								
	1.5 Types of Distributed Systems								
	Chapter 2:**Communication** 2.1Layered Protocols	2	6		6			2	14hrs
	2.2Client-server TCP								
	2.3 Middleware protocols								
	2.4Remote procedure call and remote object invocation								
	2.5 Message oriented and stream-oriented communication								
	2.6 Quality of Service								
	Chapter 3:**Processes** 3.1Threads and their implementation	3	6		9		2	2	19hrs
	3.2Object servers and adaptors								

	3.3Code migration								
	3.4 Software agents and agent technologyAgent communication languages (ACL)								
	Chapter 4:**Naming** 4.1Naming entities	3	3		9		2	2	16hrs
	4.2Name spaces and name resolution; DNS and X.500								
	4.3Different approaches in locating mobile entities								
	4.4 Identifying and removing (unreferenced) unreachable entities								
	Chapter 5:**Synchronization** 5.1Clock synchronization • physical clocks • clock synchronization algorithms • logical clocks and time stamps	4	3		9			3	15hrs
	5.2Distributed transactions and concurrency control								
	5.3 Election algorithms								
	5.4 Mutual exclusions								
	Chapter 6:**Consistency and Replication** 6.1Reasons for Replication	4	3		6			2	11hrs

	6.2 Replication as Scaling Technique								
	6.3 Data-centric and client-centric consistency models								
	6.4 Replica management								
	6.5 Distribution and consistency protocols								
	Chapter 7: **Fault Tolerance** 7.1 Introduction to Fault Tolerance	2	3		6			2	11hrs
	7.2 Basic concepts								
	7.3 Failure modes								
	7.4 Failure masking by redundancy								
	7.5 Process resilience								
	7.6 Reliable client-server and group communication								
	7.7 Distributed commit								
	7.8 Recovery								
	Total								

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	3	3	6
2	Assignments	Assignment I (10%)	3	3	6
3	Project	10%	3	6	9

	4	Others		Mid Exam (30%)	2			2
	Total							
	Final Exam			Percentage 50 (%)	F2F		NF2F	SLT
	Final Exam			40%	3			3
	Grand Total SLT							
	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:Java JDK,Eclipse/Netbeans, MySQL				
			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	S. Tanenbaum and Maarten van Steen, Distributed Systems, Principles and Paradigms, Prentice Hall, 2002				
			2	S. Mullender, Distributed Systems, 2nd edition, Addison-Wesley, 1993				
			3.	K. Birman, Building Secure and Reliable Network Applications, Manning Publications Co.,1996				

Adama Science and Technology University						
1	School: ***Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***		
2	Course Category	***Core Elective/focused Area Module***				
	Course Name	***Fundamental of Cloud and Edge Computing***				
	Course Code:	***Seng4308***				
3	Synopsis:	This course is both a practical and theoretical course. It introduces cloud computing components and architecture, service and deployment models, cloud usage scenario , virtualization, security in the cloud .				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	4	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	SEng3202				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	Differentiate the trade-offs between deploying applications in the cloud and over On-premise				
	CLO2	Discuss cloud service and cloud deployment model such as basic service types—SaaS, PaaS, IaaS and Public , private , hybrid and community deployment model				

	CLO3	Apply basic cloud configuration concepts and principles based on cloud operating environment
	CLO4	Describe Basic cloud enabling technologies such as datacenter, virtualization, multitenant ,containerization technology
	CLO5	Identify security and privacy issues in cloud computing
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:	

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods				Assessment				
										L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
CLO1								√		√			√	√		√		
CLO2								√		√					√		√	
CLO3							√					√		√			√	√
CLO4							√			√			√			√		

	CLO5								√		√						√	√	
	Indicate the relevance 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	Teaching and Learning Activities						Total (SLT)
			Guided learning (F2F)				Guided Learning (F2F)	Independent Learning (NF2F)	
			L	T	P	O			

	Chapter 1. Introduction 1.1 Definition and evolution of Cloud 1.2 Understand the promise and opportunities of cloud computing along with its challenges. **1.2** Describe the technological principles that have enabled cloud computing. **1.3** Identify core features of cloud computing, such as, elasticity, multi-tenant, on-demand, ubiquitous access, usage metering, self-service, etc. **1.4** Major Cloud service provider **1.5** Application area of Cloud Computing	CLO1	4hrs				4hrs	4hrs	7hrs
	Chapter 2. Cloud service and Deployment model 2.1 Basic cloud service models such Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a	CLO2	5hrs				5hrs	3hrs	8hrs

	Service (IaaS) 2.2 basic deployment models such as Public Cloud, Private Cloud, Hybrid Cloud and Community Cloud								
	Chapter 3.Type of cloud architecture: basic , advanced and specific architectural 3.1 Basic cloud architecture 3.1Workload Distribution Architecture 3.2 Resource Pooling Architecture 3.3 Dynamic Scalability Architecture 3.5 Service Load Balancing Architecture 3.6 Cloud Bursting Architecture 3.7 Elastic Disk Provisioning Architecture	CLO3	7hrs				7hrs	6hrs	11hrs
	Chapter 4.Cloud Enabling Technology 4.1 Data Center Technology 4.2 Multitenant Technology 4.3 Containerization Technology	CLO4	6hrs		24hrs		30hrs	13hrs	43hrs

	4.4 Virtualization 4.4.1 Characteristics of virtualized environments 4.4.1.1 Increased security 4.4.1.2 Managed execution 4.4.1.3 Portability 4.4.2 Taxonomy of virtualization techniques 4.4.2.1 Execution virtualization 4.4.2.2 Other types of virtualization 4.4.2.3 Virtualization and cloud computing 4.4.3 Pros and cons of virtualization 4.4.3.1 Advantages of virtualization 4.4.3.2 The other side of the coin: disadvantages 4.4.4 Virtualization Technologies								

	4.4.4.1 Xen: paravirtualization 4.4.4.2 VMware: full virtualization 4.4.4.3 Microsoft Hyper-V								
	Chapter 5 Security and Privacy issues in cloud computing 5.1 What Is Cloud Computing Security? 5.2 Cloud Computing Security Fundamentals 5.3 Cloud Security Challenges 5.4 How to Handle Cloud Security Challenges 5.5 Cloud Computing Privacy 5.6 Trust Management	CLO4	3hrs				3hrs	2hrs	7hrs
	Chapter 6 Edge Computing 6.1 Why Do We Need Edge Computing 6.2 Key Techniques that Enable Edge Computing	CLO1	3hrs				3hrs	2hrs	

	6.3 Edge Computing Definition 6.4 Edge Computing Benefits 6.5 Edge Computing Systems								
	Total		28	24			52	30	82hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Tests	Test (10%)	1hr	2hrs	3hrs
2	Assignments	Assignment (5%)	1hrs	3hrs	4hrs
3	Quiz	Quiz (10%)	1hr		1hrs
4	Mid	Mid Exam (20%)	2hrs	6hrs	8hrs
5	Project	Project(15%)	2hrs	8hrs	10hrs
				Total	26hrs

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT
Final Exam	40%	3hrs	12hrs	12hrs
			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	Choose an item.
		2	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	no specific text book for this course , refer the listed books
		2	Cloud Computing: Concepts, Technology & Architecture, Thomas Erl; Zaigham Mahmood; Ricardo Puttini, Prentice Hall,2013
		3	Rajkumar Buyya,Christian Vecchiola,S. Thamarai Selvi,Mastering Cloud Computing:Foundations and Applications Programming,2013
		4	Cloud Computing :Methodology, Systems, and Applications Lizhe Wang ,Rajiv Ranjan ,Jinjun Chen , Boualem Benatallah

Adama Science and Technology University						
1	School: ***Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***			
2	Course Category	Core Elective/focused Area Module				
	Course Name	***Digital Forensics***				
	Course Code:	***SEng5307***				
3	Synopsis:	This course provides an introduction to the methodology and procedures associated with digital forensic analysis. Students will be introduced on creating and preserving digital evidence, data recovery and evidence collection algorithms, evidence construction and reconstruction, methods for certifying evidence, storing evidence, data acquisition, forensic analysis algorithms, image files, network forensics, logging methods to trace back attacks and digital trails, e-mail investigations. This course will incorporate demonstrations and laboratory exercises to reinforce practical applications of course instruction.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Corequisite: (if any)	**Computer Systems Security (SEng 5203)**				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					

	CLO1	explain digital forensics concepts and processes
	CLO2	discuss cyber criminal lows and digital forensics readiness
	CLO3	describe incident response processes and procedures
	CLO4	describe computer and network forensics
	CLO5	describe mobile and embedded system forensics
	CLO6	Develop an investigative process for the digital forensic investigation

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

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
														Teaching Methods				Assessment				
9		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	L	T	P	O	Test	Quiz	Assignment	Project	Lab-report
	CLO1	√												√		√						
	CLO2	√												√		√				√		

	CLO3						√							√		√			√			√
	CLO4						√							√		√						√
	CLO5						√							√		√			√	√	√	√
	CLO6		√											√		√					√	√
	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	Identify sources of evidentiary value in various evidence sources including network logs, network traffic, volatile data and through disk forensics.

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			
	syllabus introduction **Chapter 1: introduction to digital Forensics** 1.1. introduction forensics 1.2. forensic science 1.3. digital evidence 1.4. overview of computer crime	1	4		3		7	2	9
	Chapter 2 : Digital forensics process 2.1. Introduction 2.2. the identification phase 2.3. examination phase 2.4. the analysis phase 2.5. the presentation phase 2.6. common forensics software programs	1	4		4		8	3	11
	Chapter 3:cyber criminal low **3.1.**introduction 3.2. the international and legal framework of cyber criminal low 3.3. Digital crime - substantive crime low 3.4. investigation methods for collecting	2	2		3		5	2	7

	digital evidence 3.5. international cooperation inorder to collect digital evidence								
	Chapter 4: Digital forensics readiness 4.1. introduction 4.2. definition 4.3. law enforcement versus enterprise digital forensics readiness 4.4. A rational for digital forensics readiness 4.5. framework, standards and methodologies 4.6. becoming digital forensics ready 4.7. enterprise digital forensics readiness 4.8. consideration for law enforcement	2	2		3		5	2	7
	Chapter 5: Computer forensics 5.1. introduction 5.2. evidence collection, examination, analysis phases 5.3. windows, linux, Mac OS forensics	4,6	5		9		14	4	18
	Chapter 6: mobile and embedded forensics **6.1.** introduction	5,6	4		8		12	4	16

	6.2. evidence collection, examination, analysis phases 6.3. reverse engineering and analysis of application 6.4. Seizing Evidence from a Mobile Device								
	Chapter 7: internet forensics 7.1. introduction 7.2. computer networking (reading) 7.3. Tracing information on the internet 7.4. collection phase - local, network and remote acquisition 7.5. Examination and analysis phase ● finding interesting node in large network ● divide and conquer large network(clustering, community detection) ● aggregated timelines, temporal network, heatmaps 7.6. network packet and traffic analysis	4,6	5		9		14	4	18

7.7. router forensics 7.8. firewall forensics								
Chapter 8: Incident response and resources **8.1.** incident and intrusion response 8.2. system forensics resources 8.3. trends and future directions	3,6	2		3		5	2	7
Total		28		42		70	23	93hrs

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	30 min	2:00	2:30
2	Quize	Quiz (10%)	1:00	-	1:00
3	Lab-report	10%	30 min	2:00	2:30
4	Others	Mid Exam (30%)	3:00	5:00	8:00
5	Choose an item.				14:00 hrs
				Total	hrs

Final Exam	Percentage 50 (%)	F2F	NF2F	SLT

	Final Exam	40%	3:00 hrs	10:00 hrs	13:00 hrs
				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	internet connected Computer Lab
		2	Softwares
		3	mobile devices (android, i-phone, blackberry)
		4	physical visit to forensics institutions (optional)
		5	Choose an item.
13	Text book and reference: (note: ensure the latest edition /publication)	1	1. André Årnes. 2018. Digital forensics (1st Edition). John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA. ISBN: 9781119262381 2. Easttom, C. (2019). *System forensics, investigation, and response* (3rd ed.). Burlington, MA: Jones and Bartlett Learning, LLC. ISBN: 9781284121841.

Adama Science and Technology University			
1	School: ***Electrical Engineering and Computing***		Department: ***Computer Science and Engineering***
2	Course Category	Core Elective/focused Area Module	

<table>
<tr><td rowspan="2"></td><td>Course Name</td><td colspan="5">Data & Application Security</td></tr>
<tr><td>Course Code:</td><td colspan="5">SEng5308</td></tr>
<tr><td>3</td><td>Synopsis:</td><td colspan="5">Understanding application and data security is not only a critical part of a cyber-security, it is also a topic that can prepare the students for challenging and exciting careers in the IT security field. Application and data security are an important sub-discipline under the umbrella of cyber security. Application and data security provides students a look at how malware infects computers, how SQL injections and DNS injections work, as well newer domain specific topics such as healthcare information systems data security and industrial control systems security.Study of principles and practices of implementing data security in modern businesses and industries, including security principles, auditing, security implementation and database reliability.</td></tr>
<tr><td>4</td><td>Name(s) of Academic Staff:</td><td colspan="5">Dr. N. Satheesh Kumar</td></tr>
<tr><td>5</td><td>Semester and Year offered:</td><td>Semester:</td><td>II</td><td>Year:</td><td>5</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">Computer Systems Security (SEng 5203)</td></tr>
<tr><td rowspan="2">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">Explain the current technology and typical data security products.</td></tr>
</table>

	CLO2	Apply security principles to design and development database, industrial control systems, mobile apps, embedded systems and web based programs.
	CLO3	Analyze malware and its paths into file systems and structures.
	CLO4	Design security architecture in modern software systems in a typical enterprise.
	CLO5	Demonstrate the knowledge and skills for administration of user, profiles, password policies, privileges and roles.
	CLO6	Developdata security solution at the application level.

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

Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)												Teaching Methods				Assessment				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				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 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	Describe common security models of database management, and industrial control systems, and other network and network application based security paradigms.

11	Distribution of Student Learning Time (SLT)					
	Course Content Outline	CLO	Teaching and Learning Activities			Total (SLT)
			Guided learning (F2F)	Guided Learning (F2F)	Independent Learning	

								(NF2F)	
			L	T	P	O			
	Chapter 1: Overview of Data Security 1.7. Introduction 1.8. Basic Cryptography 1.9. Access Control Basics 1.10. Access Control Models 1.11. Integrity Models 1.12. Authentication Models	CLO2					4	5	9hrs
	Chapter 2 :Introduction to Data privacy 2.1. Design Principles 2.2. Access Control for Distributed Systems 2.3. Overview of Privacy Rules 2.4. K-anonymity 2.5. Privacy and Protection Laws 2.6. Privacy Issues faced by Enterprises	CLO1 CLO3					6	4	10hrs
	Chapter 3:**Privacy Preserving Distributed Data Mining** 3.1. Introduction 3.2. Malicious Logic 3.3. Malware Detection and Prevention	CLO4					6	6	12hrs

	3.4. Database Security 3.5.Security Case Study 3.6.Security Architecture								
	Chapter 4: Application Security 4.1. Introduction 4.2. Trojans 4.3. Buffer Overflows 4.4. Programming Exploits 4.5. Web Exploits 4.6. Incident Handling 4.7. Wireless Application Security	CLO6					4	4	8hrs
	Chapter 5: Operating System Principles 5.1. OS Security Principles 5.2. Administration of Users 5.3. Profiles, Password Policies 5.4. Privileges and Rules 5.5. Auditing Models	CLO5					5	3	8hrs
	Chapter 6: Software Security Concepts 6.1 Software security life cycle 6.2 Software quality attributes 6.3 Security requirement gathering principles and guidelines	CLO1 CLO4					4	3	7hrs

	Chapter 7: Vulnerabilities during implementation 7.1 SQL Injection 7.2 Cross-site Request Forgery 7.3 Session management 7.5 Secure Programming	CLO4					8	6	14hrs
	Chapter 8: Mobile Application Security 4.1 Mobile application development securities 4.2 Malware classification and analysis	CLO4 CLO6					8	4	12hrs
	Chapter 9: Design and Test for Security 9.1 Secure software design principles 9.2 Static analysis technique 9.3 Security testing	CLO2 CLO4					6	3	9hrs
	Total								89hrs

	Assessment					
	Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
	1	Assignments	Assignment I (10%)	0.5	2.5	3

	2	Quize	Quiz (10%)	2	0	2
	3	Lab-report	10%	0.5	9.5	10
	4	Others	Mid Exam (30%)	2	4	6
	5	Choose an item.				
	Total					21hrs
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	7	10hrs
	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	Computer Lab
		2	Software
		3	Simulation Room
		4	Choose an item.
		5	Choose an item.
1	Text book and reference:	1	1. Hassan A. Afyouni, Database Security and Auditing: Protecting Data Integrity and

3	(note: ensure the latest edition /publication)		Accessibility, Thomson Course Technology (c2006) 2. Basta, Alfred and Zgola, Melissa (2012). Database Security, Course Technology, Cengage Learning, ISBN: 978-0-4354-5390-6 3. Skoudis, E. with Liston, T. Counter Hack Reloaded: A Step-by-Step Guide to Computer Attacks and Effective Defenses. Prentice Hall 4. Database and Applications Security: Integrating Information Security and Data Management (Hardcover) by Bhavani Thuraisingham , Auerbach Publications; 1 edition (May 26, 2005), ISBN-13: 978-0849322242 5. Jonathan LeBlanc, Tim Messerschmidt, Identity and Data Security for Web Development: Best Practices, O'Reilly Media, 2016. 6. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications (1st ed), O'Reilly Media 2020. 7. Wenliang Du, Computer and Internet Security: A hand-on Approach (2nd ed), Wenliang Du, 2019. 8. J.D.Glaser, Secure Development for Mobile Applications with PHP and JavaScript, CRC Press, 2015.

Adama Science and Technology University						
1	School: ***Electrical Engineering and Computing***			Department: ***Computer Science and Engineering***		
2	Course Category	Core Elective/focused Area Module				
	Course Name	***Introduction to Cyber Security***				
	Course Code:	***SEng5310***				
3	Synopsis:	This course provides a basic understanding of full-spectrum cyberspace operations, the complexities of the cyberspace environment, as well as planning, organizing, and integrating cyberspace operations. The course will consist of presentations and exercises that will teach students how to develop a cyber-operations design and bring it to fruition. At the conclusion of the course, students will have a fundamental understanding of how to analyze, plan for, and execute cyberspace operations. This course, founded on concept operations and real cyber capabilities, provides students with the understanding, tools, and processes needed to conduct malware analysis with real-world malicious code samples to dissect. Students will be able to prepare and plan an effective offensive and defensive strategy, as well as evaluate covert protocols. Analysis of system specific, nondescript tools will be introduced to aid in attack and defense.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	5	

6	Credit Hour:	3
7	Prerequisite/ Co-requisite: (if any)	**Computer Systems Security (SEng 5203)**
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	identify security risks and take preventive steps
	CLO2	Identify common areas of malicious software activity and characteristics of various types of malicious software files
	CLO3	explain of Cyberspace Environment and Design
	CLO4	Identify Cyberspace Operational Approaches &Building Cyber Warriors and Warrior Corps
	CLO5	use Cyber Related Commands

9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:																					
	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO)																				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Teaching Methods				Assessment				
														L	T	P	O	Test	Quiz	Asignmen	Project	Lab-re

																				t		port
	CLO1	√												√		√						
	CLO2	√												√		√				√		
	CLO3		√											√		√			√			√
	CLO4	√												√		√						
	CLO5		√											√		√			√	√	√	√
	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	Create secure software applications by Investigate cybercrime and collect evidences and software engineering methodologies, which pertain to development, testing and documentation activities.																				

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: Fundamentals of Digital Security 1.1. Types of Attacks 1.2. Digital Privacy and Laws 1.3. Security Risks 1.4. Online Tracking 1.5. Secure Wi-Fi Setting 1.6. Cloud Storage Security 1.7. Physical Security Threads	CLO 2	4		6		10	2	12hrs
	Chapter 2 :Online Anonymity 2.1. Anonymous Networks 2.2. Tor Networks 2.3. I2P Networks 2.4. Free-net	CLO 1	6		9		15	3	18hrs

	2.5. Dark-net								
	Chapter 3:**Cyber Space Environment and Design** 3.1. Characteristics 3.2. Planning for Cyberspace Operations 3.3. Approaches to utilize cyberspace 3.4. Network Operations(NETOPS) 3.5. Defensive Cyberspace Operations(DCO) 3.6. Offensive Cyberspace Operations(OCO) 3.7. Cyberspace Integration	CLO 3	6		9		15	3	18hrs
	Chapter 4: Cyber Crime Issues 4.1.Unauthorized Access 4.2.Computer Intrusions 4.3.Internet Hacking and Cracking 4.4.Pornography 4.5.Software Piracy 4.6.Mail Bombs 4.7.Exploitation	CLO 3, CLO 4	6		9		15	3	18hrs
	Chapter 5: Investigation Tools	CLO	6		9		15	3	18hrs

	5.1.Stalking and Obscenity in Internet 5.2.Law Enforcement Roles and Responses 5.3.e-Discovery 5.4.EDRM Model 5.5.Evidence Collection and Preservation Model 5.6.IP Tracking 5.7.Search and Seizure of Computer 5.8.Recovering lost evidences 5.9.Password Cracking	5							
	Total		28		42		70	14	84hrs

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	1	4	5hrs
2	Quiz	Quiz (10%)	2	8	10hrs
3	Lab-report	5%	30 min	2:30	3hrs

	4	Others	Mid Exam (25%)	2:30	4:30	7hrs
	5	Project	Project(10%)	30 min	2:30	3hrs
	Total					28hrs
	Final Exam		Percentage 50 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	5	8hrs
	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	Computer Lab			
		2	Software			
		3	Computer Lab			
		4	Choose an item.			
		5	Choose an item.			
13	Text book and reference: (note: ensure the latest	1	1. Digital Privacy and Security Using Windows: A Practical Guide By Nihad Hassan, Rami Hijazi, Apress 2. Cyber Crime Investigation, DSCI - Nasscom, 2013.			

	edition /publication)		3. Paulo Shakarian et al. "Introduction of Cyber Warfare: A Multidisciplinary Approach," syngress, Elsevier 2013. 4. Jason Andress et al. "Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners" Syngress, Elsevier 2013.

Adama Science and Technology University		
1	School***: SOEEC***	Department: ***Computer Science and Engineering***
2	Course Category	
	Course Name	***Introduction to Big Data***
	Course Code:	***SE5302***
3	Synopsis:	The course starts with Big Data basics and foundations, then moves to Big Data Platforms and Data Storage Solutions. It discusses different types of Big Data analytics algorithms that are commonly used to process and manipulate huge size of data (Big Data). It also includes Cloud Platforms Solutions available in the current market such as: Amazon Web Services (AWS), Google Cloud Platform, Microsoft Azure, IBM Bluemix, Pivotal Cloud Foundry, Yahoo Cloud Platform etc. In addition, It teaches fundamental techniques of streaming Big Data processing. The course also covers how to design and implement software systems that manage and organize large size data. Finally, Dig data visualization techniques, and tools will be discussed.

4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	II	Year:	5	
6	Credit Hour:	3				
7	Prerequisite/ Co-requisite: (if any)	Data Structures and Algorithms				
8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:					
	CLO1	▪ Describe the basic characteristics and types of Big Data solutions				
	CLO2	▪ Design Data-driven decision-making applications using conceptual frameworks designed for massively parallel computing infrastructure.				
	CLO3	▪ Analyze hidden patterns in large data sets and propose robust algorithms for big data processing tasks.				
	CLO4	▪ Combine existing solutions with scalable computing and storage infrastructures and provide cost effective industrial solution to big data processing and analysis task.				
	CLO5	▪ Identify the shortcomings of existing big data platform and propose improvements in the design of the tools and techniques .				
	CLO6	▪ Compare various big data products and recommend the best platform and tools based on their Functionality, Security and Privacy Issues.				
9	Mapping of the course Learning Outcomes to the program Learning Outcomes, Teaching Methods and Assessment:					

	Course Learning Outcomes (CLO)	Program Learning Outcomes (PO) PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9				Teaching Methods L	T	P	O	Assessment Test	Quiz	Assignment	Project	Lab-report
	CLO1								√					√			√	√		√		
	CLO2	√								√				√	√	√						
	CLO3		√				√							√		√		√	√			√
	CLO4	√	√		√									√		√	√	√		√		√

	CLO5			√				√						√		√	√	√		√		
	CLO6					√	√							√		√					√	
	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	Teaching and Learning Activities			Total (SLT)
			Guided learning (F2F)	Guided Learning (NF2F)	Independent Learning (NF2F)	

			L	T	P	O			
	Chapter 1: Introduction of Big Data Analytics 1.1 Definitions, Software and Tools for Massive **Big Data** Processing. 1.2 Security, Privacy Issues in Big Data. 1.3 Scalable Architectures for Massively Parallel Data Processing. 1.4 Data Mining Tools and Techniques for Big Data. 1.5 Scalable Storage Systems for Big Data. 1.6 Web and Social Networks	CLO 1					6	4	10

	Chapter 2: Big Data Platforms and Data Storage 2.1 Map-reduce and Big Data analyticsMap-reduce theory, Hadoop, Hive and Pig, Functional decomposition 2.2 Apache Spark, MS Azure, Claudera, HDFS 2.3 Cassandra, MongoDB, NoSQL databases	CLO 1 CLO 2					10	5	15
	Chapter 3: Big Data Analytics Algorithms 3.1 Data Preprocessing in Big Data environment 3.2 Linear Regression on Big Data task 3.3 Classification, Clustering in big data environment 3.4 Other ML algorithms in context of Big data 3.5 Clustering Big Data	CLO 3 CLO 5					12	4	16

	Chapter 4: Linked Big data Analytics 4.1 Use of structured data in Big data environments 4.2 Applications of linked data structures in big data	CLO 4					8	3	11
	Chapter 5: Graph Database and Analytics 5.1 Use of graph database 5.2 Graph based fraud detection, 5.3 Social network analysis, 5.4 Recommendation engines etc.						6	3	9
	Chapter 6: Streaming Big Data Analytics 6.1 Google Cloud flow, 6.2 Apache kafka, 6.3 Apche storm, 6.4 Stream SQL, 6.5 Spark Streaming etc.	CLO 5 CLO 6					10	6	16

	Chapter 7: Big Data Visualization 7.1 Google Charts, 7.2 Tableau, Grafana, 7.3 Chartist, 7.4 FusionCharts, 7.5 Datawrapper, 7.6 Infogram, 7.7 ChartBlocks, and D3. js	CLO 6	√ √				8	4	12
	Total								89

Assessment

Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	-	2	2
2	Assignments	Assignment I (10%)	30 Minutes	2:30	3
3	Project	10%	30 Minutes	11:30	12
4	Others	Mid Exam (30%)	2	4	6

	5	Choose an item.				
					Total	21
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	3	7	10
					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	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	1. Evan Stubbs, Big Data, Big Innovation: Enabling Competitive Differentiation through Business Analytics *[1 ed.]* 2. Kuan-Ching LiKuan-Ching Li, Big data : algorithms, analytics, and applicationsBig data : algorithms, analytics, and applications 3. Arshdeep Nahga, Vijay Madisetti, Big Data Science and Analytics: A Hands-on Approach, 2019. 4. Nathan Marz. James Warren, Big Data Principles and best practices of scalable real-time data systems, Manning Publications, 2015. 5. Eric Pimpker, Introduction to Data Visualization and Exploration with R, GeoSpatial Training			

			Services, 2017 6. Martin Kleppmann, Designing Data-Intensive Applications, O'REILLY, 2017 7. Alex Gorelik, The Enterprise Big Data Lake, O'REILLY, 2019
		2	Prajapati V., Big data analytics with R and Hadoop 1. Coursera MOOC's on Big Data Specialization

Adama Science and Technology University						
1	School: ***Electrical and Computing Eng***			Department: ***Computer Science & Engineering***		
2	Course Category	***Core Module***				
	Course Name	***Formal Methods in Software Engineering***				
	Course Code:	***SEng3203***				
3	Synopsis:	This course introduces to Formal Methods used in software engineering. It discusses elements of discrete mathematics, formal mechanisms for specifying and verifying the correctness, reliability and efficiency of software systems. Explains how formal methods can help to eliminate errors early in the design process. The topics initially revise basic mathematical concept like proposition, predicates, sets, series or sequences and mathematical proofs. Then,it use theseconcepts and techniques to and demonstrate how specification can be scrutinized using the Formal Methods. It alsofocuses on formal specification methods and techniques of software application development that are used to confirm the correctness of the software being developed.				
4	Name(s) of Academic Staff:					
5	Semester and Year offered:	Semester:	I	Year:	3	
6	Credit Hour:	3				

7	Prerequisite/ Co-requisite: (if any)	**SEng2102** Fundamentals of Software Engineering and basic understanding of logic and discrete structures

8	Course Learning Outcome (CLO): At the end of the course the student will be able to do:	
	CLO1	Explain several formal methods withdifferent development stages, different methodologies, different application domains.
	CLO2	Apply formal method to develop and test a software system.
	CLO3	Explain the advantage of formal method for program development.
	CLO4	Describe how Formal methods are increasingly being used to provide stronger assurances, especially in early phases of software development.
	CLO5	Analyze formal methods approach to software construction.

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

(CLO)	Program Learning Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	Teaching Methods	Assessment				
											Test	Quiz	Assign	Project	Lab-

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

1 0	Transferable Skills (if applicable) (Skills learned in the course of study which can be useful and utilized in other settings)	
	1	Embedded software
	2	Tool design decisions
	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: Introduction to Formal Methods 1.1 Overview 1.2 SDLC(Revise Software Development) 1.3 Formal Method 1.4 Advantage and Disadvantage 1.5 Critical Software 1.6 Integrity Level 1.7 Stages in Formal Methods	CLO1	√				8	4	12hrs

	Chapter 2: Proposition 2.1 Introduction to Proposition 2.2 Proposition Operators 2.3 Introduction to Truth Table 2.4 Result terminology 2.5 Proposition Exercise	CLO1	√				8	4	12hrs
	Chapter 3: Predicates 3.1 Introduction 3.2 Existential 3.3 Universal and exercises	CLO2,3	√				6	4	10hrs
	Chapter 4: Sets 4.1 Universe 4.2 Elements 4.3 Cardinality 4.4 Sets Relationship, Sets Operation, Exercise	CLO4	√				6	4	10hrs

	Chapter 5: Series or Sequence and Mathematical Proof 5.1 Finite Sequence, Infinite Sequence ,Arithmetic Sequence, Geometric Sequence 5.2 Find Sequence for a given term 5.3 Find Sum for a given sequence and term 5.4 Direct Proof 5.5 Contradiction Proof 5.6 Contra positive Proof, Induction Proof, exercises	CLO4 CLO4					10	5	15hrs
	Chapter 6: Testing 6.1 SDLC 6.2 Test Plan and Test case 6.3. Test Flow Test Size 6.4 Test Depth and Other Testing	CLO5					10	5	15

	Chapter 7: Application to Formal Specification methods 7.1 Analyze Stage, Design Stage 7.2 Formal method, 7.3 Formal Specification and proofs, 7.4 Formal Specification in the SDLC 7.5 Model checking, 7.6 Abstraction Model and Z notation	CLO5	√				10	5	15
	Total								89hrs

Assessment					
Continuous Assessment		Percentage Total-60(%)	F2F	NF2F	SLT
1	Assignments	Assignment I (10%)	0	3	3
2	Quize	Quiz (10%)	√ 3	3	4.5

	3	Project	15%	0.5	7	7.5
	4	Others	Mid Exam (25%)	1	5	6
	5	Choose an item.				
	Total					21hrs
	Final Exam		Percentage 40 (%)	F2F	NF2F	SLT
	Final Exam		40%	√ 3	7	10
	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,	1	Software
		2	Computer Lab
		3	Choose an item.
		4	Choose an item.
		5	Choose an item.

	simulation room …etc.)		
13	Text book and reference: (note: ensure the latest edition /publication)	1	1. Markus Roggenbach, Antonio Cerone, Bernd-Holger Schlingloff, Gerardo Schneider, Siraj Ahmed Shaikh, *Formal Methods for Software Engineering: Languages, Methods, Application Domains* (1st ed), *Publisher: Springer Nature Switzerland AG,* I*SBN-10: 3030387992 ISBN-13: 9783030387990)*, 2020 2. Ioana Rodhe3, I.Van Horebeek & J. Lewi, *Overview of Formal Methods in Software Engineering*, Ebook, 2015. 3. Butler, Michael, Formal Methods, and Software Engineering, 4. Jing Sun, *Formal Methods and Software Engineering*, ebook 2016. 5. Antoni Diller, An Introduction to Formal Methods, (1st ed),, Wiley, 1999. 6. *An Introduction to Formal Methods by* A. Diller, *Z,* (2nd ed.), Wiley, 2004. 7. Jiacun Wang, William Tepfenhart, Formal Methods in Computer Science, Chapman and Hall, 2019.
	Web resources		http://en.wikipedia.org/wiki/Formal_methods http://en.wikipedia.org/wiki/Proposition http://en.wikipedia.org/wiki/Predicate_logic http://en.wikipedia.org/wiki/Set_(mathematics)

8. Course Summary Mapping with PO

Table 17: Mapping of Courses with PO

Course Category	*Course Code*	*PO-1*	*PO-2*	*PO-3*	*PO-4*	*PO-5*	*PO-6*	*PO-7*	*PO-8*	*PO-9*
Course category: Basic Mandatory Course level: School required	Math1101	√	√							
	Math1102	√	√				√			
	Math2101	√	√				√			
	Phys1101	√	√							
	Chem1101	√	√				√			
	CSEg1102	√			√					
	CSEg1101	√	√						√	
	EPCE2101	√	√							
	ECEg2101	√	√							
	CSEg1104	√	√	√						
	CSEg2101	√	√	√						√
	CSEg2210	√	√							
	ECEg4102	√	√				√			

Course Category	***Course Code***	***PO-1***	***PO-2***	***PO-3***	***PO-4***	***PO-5***	***PO-6***	***PO-7***	***PO-8***	***PO-9***
	MENg1032	√	√							
	Overall	√	√	√			√		√	√
Course category: Major Mandatory Course level: Department required	SEng2202	√	√	√	√					
	SEng2204	√	√							
	SEng2206	√		√	√		√		√	√
	SEng2208	√	√	√	√					
	SEng3200	√	√	√	√	√	√	√	√	√
	SEng3201			√	√	√	√		√	√
	SEng3202	√		√	√		√		√	√
	SEng3203	√	√						√	√
	SEng3204				√		√		√	√
	SEng3205	√	√				√			
	SEng3206	√	√		√		√		√	√
	SEng3207	√	√						√	√
	SEng3208	√	√		√		√		√	√

Course Category	*Course Code*	*PO-1*	*PO-2*	*PO-3*	*PO-4*	*PO-5*	*PO-6*	*PO-7*	*PO-8*	*PO-9*
	SEng3209	√	√		√		√			
	SEng4200	√	√	√	√	√	√	√	√	√
	SEng4201	√	√	√	√			√	√	
	SEng4203	√	√	√	√		√			
	SEng4204	√		√	√	√	√		√	√
	SEng4205	√	√		√	√	√		√	
	SEng4206	√	√	√	√	√		√		
	SEng4208	√	√		√		√		√	√
	SEng5201	√	√	√	√	√	√	√	√	√
	SEng5202	√	√	√	√	√	√	√	√	√
	SEng5203	√	√	√	√		√		√	
	SEng5204	√	√		√		√		√	√
	Overall	√	√	√	√	√	√	√	√	√
Major Elective Course level:	ECEg3201	√	√		√	√		√	√	
	ECEg3304	√	√		√	√	√			

Course Category	*Course Code*	***PO-1***	***PO-2***	***PO-3***	***PO-4***	***PO-5***	***PO-6***	***PO-7***	***PO-8***	***PO-9***
	SEng4302	√	√		√		√		√	√
	SEng3301	√	√	√	√		√	√	√	
	SEng4304	√	√		√		√		√	√
	SEng5303	√	√		√		√			
	SEng3304	√	√	√	√		√	√	√	√
	SEng3306	√	√	√	√			√	√	√
	SEng5305			√	√		√	√	√	√
	SEng5302		√			√	√	√	√	√
	SEng3303	√	√	√	√	√				
	SEng5301			√	√		√	√	√	√
	SEng4307									
	SEng4303									
	SEng4306									
	SEng5304		√			√	√	√	√	√
	SEng5306		√	√	√	√	√	√	√	

Course Category	***Course Code***	***PO-1***	***PO-2***	***PO-3***	***PO-4***	***PO-5***	***PO-6***	***PO-7***	***PO-8***	***PO-9***
	SEng3308	√	√			√	√	√	√	√
	SEng4305	√	√		√		√		√	√
	SEng4308	√	√			√	√	√	√	√
	SEng5307			√	√		√	√	√	√
	SEng5308	√	√		√		√		√	√
	SEng5310			√	√		√	√	√	√
	Overall	√	√	√	√	√	√	√	√	

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Endorsement

This curriculum document is endorsed by the ASTU Senate

Date Endorsed

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