Debre Berhan University

College of Computing

Department of Computer Science

Curriculum for B.Sc. in Computer Science Program

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Ethiopia

Curriculum Revision Team Members

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Acronyms

B.Sc.	Bachelor of Science
Cr. Hrs.	Credit Hours
EHEECE	Ethiopian Higher Education Entrance Certificate Examination
ECTS	European Credit Transfer System
HLI	Higher Learning Institution
MoSHE	Ministry of Science and Higher Education

1. Introduction

Computers play a major role in shaping the information or the knowledge age. They are also becoming essential in almost all activities of human life. Furthermore, with the decline in the price of computer hardware, nations, organizations and individuals that couldn't afford to have computers some years back can now afford to acquire them. However, the acquisition of the hardware is just one step towards computerization. The most important step is to be able to use them properly.

This necessitates for a high number of skilled computer scientists who will develop the necessary applications for the computers, who will administer the computer systems and who will decide on computer system acquisitions of the organizations and all automation processes in general.

Institutions, enterprises, organizations and companies in all sectors, public and private, are directly or indirectly being affected by the overwhelming information flow around the world. The effect goes down to small businesses and even to individuals. Every such unit should be equipped with tools that enable it to survive in such a dynamic world. Ethiopia is no exception and we must get ready to cope up with the influence of the knowledge age in our day-to-day life.

A curriculum in Computer Science must be designed in such a way that it addresses the current needs of the country. Currently, the country has no sufficient number of competent computer professionals in the various fields of Computer Science. Various Governmental and other organizations have the desire to use modern information technology. However, there is an acute shortage of technical staff.

Rationale

Computer Science is an exciting, challenging and dynamic discipline. Computers form an integral part of every aspect of society and modern life. New computing technologies are introduced at an enormous rate and the Computer Science field develops and changes continually and rapidly. Consequently, Computer Science has evolved into a dynamic and challenging field of study.

Students in the course of their degree are exposed to the theoretical foundations in all areas of the field, gain an understanding of the principles that underlie development of systems, apply their knowledge on real life projects and acquire the necessary knowledge and skills to cope with the astonishing rate of change of the specific discipline.

The curriculum is in compliance with the already established standards proposed by international Computer Societies. Graduates are well equipped to successfully follow fulfilling career paths in many diverse areas of business and academia.

2. Mission, Vision and Objectives

3.1 Mission

The mission of B.Sc. curriculum in Computer Science is to deliver an internationally recognized study program in Computer Science through an innovative and effective process to upgrade the students' learning towards the national and international standards that meet the 21st century standards, and to the nation development goal of 2030.

3.2 Vision

The B.Sc. curriculum in Computer Science will:

- Provide an environment of learning that fosters competency, growth, and appreciation of Computer Science in diverse fields such as science, engineering, architecture, business, health, and the like.
- Promote students to be actively involved in social activities and cooperation with other academic institutions, governmental bodies, and business companies; to encourage their talents, creativity, teamwork, decision-making and problem-solving abilities.
- Produce Computer Scientists with the Computer Science foundation and adaptive skills to serve in different sectors.
- Prepare students with essential knowledge of Computer Science for successful graduate study, scientific research, and concentration in specific areas of the discipline and beyond.
- Implement efficient, effective, transparent, IT-based learning to familiarize students to current technology.

3.3 Objectives

The primary objective of the program is to produce a high-quality graduate with an entrepreneurial and problem-solving mind-set. The specific objectives of the program are:

- Provide an in-depth understanding of the fundamental principles and techniques of Computer Science.
- Develop Computer Science concepts and definitions, and to extend and generalize them to new situations.
- Educating and training students for the very dynamic and rapidly changing science and technology market.
- Educating and training students to become life-long learners by providing them with a sound base in computer science, basic sciences as well as general education.

- Make students understand the connections between Computer Science and other disciplines, and being able to recognize Computer Science ideas embedded in other contexts.
- Develop the fundamental concepts of Computer Science modelling and how to apply Computer Science to real-world situations.
- Motivating students to become innovators who can respond very positively to the challenges and opportunities presented by new ideas and technologies.
- Laying a strong foundation for, and instilling confidence in students who may want to pursue post-graduate studies later in life.

3. Professional Profile

Through document analysis on different research organization websites in the field of computer science and based on other universities' computer science programs, it has been found professionals in the field of computer science do have knowledge and skills in software design and implementation, devising new ways of to use computers, developing effective ways to solve computing problems, generating new knowledge through research as in bioinformatics and intelligent systems, presenting findings clearly ,and using computers for the betterment of society.

Computer science professional must have

- A high-level understanding of computing systems as a whole. This understanding must go beyond the implementation details of the various components to encompass an appreciation for the structure of computer systems and the processes involved in their construction and analysis.
- Thorough understanding of the balance between theory and practice and the essential link between them not only the theoretical underpinnings of the discipline but also how that theory influences practice
- A solid foundation that allows and encourages them to maintain their skills as the field evolves.

Areas of Competences	Professional Profile
Cognitive Knowledge Skill	▪ Analyze and demonstrate a high-level understanding of theory and principles of Computing systems as a whole ▪ Conduct research in computing to generate new knowledge ▪ Apply knowledge and innovative skills to plan, set up and run businesses.
Practical Skills	▪ Demonstrate, deploy, design and implement computing systems ▪ Exercise management and administration of computing systems
Attitude (Transferable Skills)	▪ Prepare, present and reporting research findings orally and in writing. ▪ Apply managerial skills

4. Graduate Profile

The graduate will have the following knowledge, skill and attitude at the end of the program.

A) Cognitive knowledge skill

- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to computer science.
- Use such knowledge and understanding in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
- Identify and analyze criteria and specifications appropriate to specific problems, and plan strategies for their solution.
- Analyze the extent to which a computer-based system meets the criteria defined for its current use and future development.
- Deploy appropriate theory, practices, and tools for the specification, design, implementation, and evaluation of computer-based systems.
- Recognize the need for, and an ability to engage in, continuing professional development and the knowledge and skills to act as research assistants or lecturers in higher education institutions.

B) Practical skills

- Specify, design, and implement computer-based systems.
- Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
- Apply the principles of human-computer interaction to the evaluation and construction of a wide range of materials including user interfaces, web pages, and multimedia systems.
- Identify any risks or safety aspects that may be involved in the operation of computing equipment within a given context.
- Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems.
- Use current techniques, skills, and tools necessary to maintain and administer computer-based systems.
- Apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;

C) Attitude (Transferable skill)

- Make succinct presentations to a range of audiences about technical problems and their solutions.
- Be able to work effectively as a member of a development team.
- Understand and explain the quantitative dimensions of a problem.
- Manage one's own learning and development, including time management and organizational skills
- Keep abreast of current developments in the discipline to continue one's own professional development.
- Recognize and be guided by the social, professional, and ethical issues involved in the use of computer technology.

5. Program Requirement

6.1. Admission Requirement

Placements to all regular undergraduate programs are processed through the Ministry of Science and Higher Education (MoSHE). The universities then conduct admission and enrollment to the program based on results of the Ethiopian Higher Education Entrance Certificate Examination (EHEECE). For second year and above, and other applicants holding diploma (regular advanced), evening, distance (if any) and summer programs, admission will be provided if an applicant meets the minimum requirements set by each university.

6.2. Duration of the Study

The duration of the study for the regular B.Sc. program in Computer Science is 4 years.

6.3. Mode of delivery

All courses should be delivered on a semester basis and face-to-face teaching.

6.4. Method of Teaching

The teaching learning process in this program mainly follows the principle of active learning. The students should be engaged in assignments, quizzes, tutorials, laboratories, project demonstrations, lectures and field trip/ industrial visit.

6.5. Grading System

The grading system of the B.Sc. program in Computer Science is fixed scale and indicated in Table 1.

Table 1: Grading System

Scale	Letter grade	Number grade	Status
[90 – 100]	A+	4	Excellent
[85 - 90)	A	4	
[80 - 85)	A-	3.75	
[75 - 80)	B+	3.5	Very Good
[70 - 75)	B	3	
[65 – 70)	B-	2.75	Good
[60 – 65)	C+	2.5	
[50 – 60)	C	2	Satisfactory
[45 – 50)	C-	1.75	Unsatisfactory
[40 – 45)	D	1.00	Poor
[0 – 40)	F	0	Fail

6.6. Graduate Requirement

Every candidate for B.Sc. degree in Computer Science must fulfill the following requirements for graduation:

6.6.1. Minimum cumulative Grade Point Requirement for graduation is 2.00.

6.6.2. The required compulsory, elective, supportive and common courses with their respective total ECTS, Cr. Hrs, and number of courses for graduation with the Degree of Bachelor of Science in Computer Science is indicated below in Table 2.

Table 2: Total required courses

No	Course Category	No. of courses	Cr. Hrs	ECTS
1	Compulsory	30	89	148
2	Elective	2	6	10
3	Supportive	7	21	35
4	Common	13	32	54
Total		**52**	**148**	**247**

6.6.3. Educational visit: educational tours will help inspire the next generation of computer scientists by showing them the practical application of the subject in an exciting and informative way. Each batch of students are expected to visit a minimum of 2 popular companies/organizations in the field.

7. Degree Nomenclature

English: ***Bachelor of Science Degree in Computer Science***

Amharic: **የሳይንስ ባችለር ዲግሪ በኮምፒውተር ሳይንስ**

8. Quality Assurance

- Comprehensive examinations and colleague assessment of examination papers and teaching methods;
- Periodical workshops (with stakeholders, teachers and graduates);
- Assessments by using survey project works (researches), internships, and link programs;
- Graduates' evaluation of the program;
- Standardization of course offerings through preparation of general course outlines, exam contents, and external audit;
- Annual assessment of the program by the teaching staff;
- Establishing Alumni of Graduates as a mechanism to assess their career development;
- Working closely with the relevant professional associations to assess graduates' performance.
- Ensuring lab sessions conduction manner as per the requirements set in the curriculum.

9. Assessment and Evaluation

Cognitive Abilities: Cognitive abilities are assessed by a combination of written examinations and continuous assessment, including marked essays, class tests and computer programming problems.

Practical Abilities: Practical Abilities are assessed mostly by continuous assessment. Some of practical abilities are assessed as part of group project module.

Transferable skills: some skills, like the use of software tools and ability to communicate orally and in written form are directly assessed, in assignments or projects, other skills are not directly assessed but their effective use will enhance the students' overall performance.

Evaluation will be done based on the midterm exam, assignments, laboratory sessions demonstrations, Project work, final exam and different continues assessments.

10. Course Policy

This policy applies for all courses in the program:

- It is mandatory to attend all classes such as lecture class, laboratory sessions, tutorials and seminars. However, with distinct circumstance up to 80% will be entertained.
- It is mandatory to pass 50% of the lab exam, in order to be eligible for the final. This is applied for all practical courses.
- Plagiarism will cause not only automatic course dismissal but also academic discipline based on the rules and regulations of the university.
- If someone is caught while cheating during final examination, his/her grade will automatically be 'F' also academic discipline may be taken based on the rules and regulations of the university. However, other assessments are evaluated as '0'.
- If someone misses any assessments with a valid justification, he/she has a right to sit for makeup exam.
- Students are not allowed to enter to examination rooms after 30 minutes of examination commencement.

11. Course Coding

All Computer Science courses are coded ''CoSc'' followed by four digits, where

I. The first digit indicates the year in which the course is offered. That is 1 refers to year one, 2 refers to year two, 3 refers to year three, and 4 refers to year four.

II. The next two digits indicate the area (category)of the course, where all Computer Science courses are categorized depending on similarity of the courses as shown in Table 3.

Table 3: **Course categories with their corresponding course categories/Module numbers**

Course Category	Code	Courses Under Category
Basic programming and Emerging Technologies	01	Introduction to Emerging Technologies
		Computer programming
		Fundamental of Programming in C++
Computer Architecture and Operating Systems	02	Computer organization and architecture
		Operating System
		Microprocessor and Assembly Language Programming
		Real time and embedded system
Computer Networking and Security	03	Data Communication &Computer Networking
		Wireless Communication and Mobile Computing
		Computer Security

		Network and System Administration
		Introduction to Distributed Systems
Database Systems	04	Fundamentals of Database Systems
		Advanced Database Systems
Advanced Programming	05	Object Oriented Programming
		Java Programming
		Event-Driven Programming
System Development	06	Software Engineering
Computer Graphics and HCI	07	Computer Graphics
		Human Computer Interaction
		Multimedia
		Simulation and Modeling
Web and Application Development	08	Web programming
		Mobile Application Development
Algorithms	09	Design and Analysis of Algorithms
		Data Structures and Algorithms
Compiler Development and Complexity	10	Automata and Complexity Theory
		Compiler Design
Intelligent Systems	11	Introduction to Artificial Intelligence
		Introduction to Data Mining and Data Warehousing
		Introduction to Machine Learning
		Introduction to Natural Language Processing
		Computer Vision and Image Processing
Projects and Research	12	Industrial Practice
		Research Methods in Computer Science
		Final Year Project I
		Final Year Project II
Selected topics	13	Selected topics in Computer Science

III. The last digit indicates the semester in which the course is offered. If it is odd, the course is offered during the first semester, and if it is even, the course is offered during the second semester.

For example: CoSc 3023 (Operating Systems), is the course which will be given in the third year first semester and the course is categorized under category 02.

Note: The course Introduction to Emerging Technologies is treated differently as its course code is assigned by MOSHE.

12. Course list with credit hours

Table 4: **List of compulsory courses**

No	Course Name (Course Title)	Course Code	ECTS	Cr. Hr.
1.	Introduction to emerging technologies	EmTe 1012	5	3
2.	Computer programming	CoSc1012	5	3
3.	Fundamental of Programming in C++	CoSc2015	5	3
4.	Computer organization and Architecture	CoSc2022	5	3
5.	Microprocessor and Assembly Language Programming	CoSc3025	5	3
6.	Operating Systems	CoSc3023	5	3
7.	Real time and embedded system	CoSc3026	5	3
8.	Data Communication and Computer Networks	CoSc2032	5	3
9.	Network and System Administration	CoSc4036	5	3
10.	Wireless Communication and Mobile Computing	CoSc3034	5	3
11.	Computer Security	CoSc4035	5	3
12.	Introduction to Distributed Systems	CoSc4038	5	3
13.	Fundamentals of Database Systems	CoSc2041	5	3
14.	Advanced Database Systems	CoSc2042	5	3
15.	Object Oriented Programming	CoSc2051	5	3
16.	Java Programming	CoSc3053	5	3
17.	Software Engineering	CoSc3061	5	3
18.	Computer Graphics	CoSc3072	5	3
19.	Computer Vision and Image Processing	CoSc4113	5	3
20.	Web programming	CoSc3081	7	4
21.	Data Structures and Algorithms	CoSc2092	5	3
22.	Design and Analysis of Algorithms	CoSc3094	5	3
23.	Automata and Complexity Theory	CoSc3101	5	3
24.	Compiler Design	CoSc4103	5	3
25.	Introduction to Artificial Intelligence	CoSc3112	5	3
26.	Industrial Practice	CoSc3122	3	2
27.	Research Methods in Computer Science	CoSc4123	3	2
28.	Final Year Project I	CoSc4125	5	3
29.	Final Year Project II	CoSc4126	5	3
30.	Selected Topics in Computer Science	CoSc4132	5	3
Total			**148**	**89**

Table 5: **List of elective courses**

No	Course Title (Course Name)	Course Code	Cr. hrs	ECTS
1.	Event-Driven Programming	CoSc4055	3	5
2.	Human Computer Interaction	CoSc4075	3	5
3.	Multimedia	CoSc4077	3	5
4.	Simulation and Modeling	CoSc4079	3	5
5.	Mobile Application Development	CoSc4083	3	5
6.	Introduction to Data Mining and Data Warehousing	CoSc4112	3	5
7.	Introduction to Machine Learning	CoSc4114	3	5
8.	Introduction to Natural Language Processing	CoSc4116	3	5
Total			**6**	**10**

Table 6: **List of supportive courses**

No	Course Title	Course No	Cr. hrs.	ECTS
1	Mathematics for natural science	Math 1011	3	5
2	Applied Mathematics I	Math1041	3	5
3	Linear Algebra	MATH2011	3	5
4	Probability and Statistics	STAT2015	3	5
5	Digital Logic Design	EENG2041	3	5
6	Discrete Mathematics and Combinatory	MATH2052	3	5
7	Numerical Analysis	MATH2082	3	5
Total			21	35

Table 7: **List of Common Courses**

No	Course Title	Course No	Cr. hrs.	ECTS
1	Communicative English Language Skills I	FLEn1011	3	5
2	General Physics	Phys1011	3	5
3	General Psychology	Psch1011	3	5
4	Critical Thinking	LoCT1011	3	5
5	Physical Fitness	SpSc1011	P/F	0
6	Geography of Ethiopia and the Horn	GeES1011	3	5
7	Communicative English Language Skills II	FLEn1012	3	5
8	Social Anthropology	Anth1012	2	3
9	Moral and Civic Education	MCiE1012	2	3
10	Economics	ECON2103	3	5
11	Entrepreneurship & Business Development	MGMT3102	3	5
12	Global trends	GLTr 1012	2	4
13	Inclusiveness	SINE2011	2	4
Total			**32**	**54**

Table 8: **Summary of the total credit hours and ECTS for each course category**

No	Course Category	Cr. Hrs	ECTS
1	Compulsory	89	148
2	Elective	6	10
3	Supportive	21	35
4	Common	32	54
Total		**148**	**247**

Table 9: **Course Distribution for each year and each Semester**

1. **Year 1 Semester 1**

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs	Lab. Hrs	Tut. Hrs
1.	Math1011	Mathematics for Natural Science	5	3	3	0	2
2.	FLEn1011	Communicative English Language Skills I	5	3	3	0	0
3.	Phys1011	General Physics	5	3	2	1	2
4.	Psch1011	General Psychology	5	3	3	0	0
5.	LoCT1011	Critical Thinking	5	3	3	0	0
6.	SpSc1011	Physical Fitness	0	P/F	2	0	0
7.	GeES1011	Geography of Ethiopia and the Horn	5	3	3	0	0
Sub Total			**30**	**18**	**19**	**1**	**4**

2. **Year 1 Semester 2**

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs	Lab. Hrs.	Tut. Hrs.
1.	FLEn1012	Communicative English Language Skills II	5	3	3	0	0
2.	Anth1012	Social Anthropology	3	2	2	0	0
3.	Math1041	Applied Mathematics I	5	3	3	0	2
4	GLTr 1012	Global trends	4	2	2	0	0
5	EmTe1012	Introduction to Emerging Technologies	5	3	3	0	2
6	MCiE1012	Moral and Civic Education	3	2	2	0	0
7	CoSc1012	Computer programming	5	3	2	3	1
	Sub Total		**30**	**18**	**17**	**3**	**1**

3. Year 2 Semester 1

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	EENG2041	Digital Logic Design	5	3	2	3	0
2.	CoSc2015	Fundamental of Programming in C++	5	3	2	3	1
3.	MATH2011	Linear Algebra	5	3	3	0	1
4.	CoSc2041	Fundamentals of Database Systems	5	3	2	3	2
5.	ECON2103	Economics	5	3	3	0	0
6.	STAT2015	Probability and Statistics	5	3	3	0	1
7.	SINE2011	Inclusiveness	4	2	2	0	0
Sub Total			**34**	**20**	**17**	**9**	**5**

4. Year 2 Semester 2

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	CoSc2032	Data Communication and Computer Networks	5	3	2	3	2
2.	CoSc2042	Advanced Database Systems	5	3	2	3	2
3.	MATH2082	Numerical Analysis	5	3	2	3	0
4.	MATH2052	Discrete Mathematics and Combinatorics	5	3	3	0	0
5.	CoSc2092	Data Structures and Algorithms	5	3	2	3	2
6.	CoSc2022	Computer organization and Architecture	5	3	3	0	1
7.	CoSc2052	Object Oriented Programming	5	3	2	3	2
Sub Total			**35**	**21**	**16**	**15**	**9**

5. Year 3 Semester 1

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	CoSc3023	Operating Systems	5	3	2	3	2
2.	CoSc3081	Web programming	7	4	3	3	1
3.	CoSc3053	Java Programming	5	3	2	3	2
4.	CoSc3061	Software Engineering	5	3	3	0	2
5.	CoSc3101	Automata and Complexity Theory	5	3	3	0	2
6.	CoSc3025	Microprocessor and Assembly Language Programming	5	3	2	3	1
Sub Total			**32**	**19**	**15**	**12**	**10**

6. Year 3 Semester 2

No.	Course Code	Course Title	ECTS	Cr. Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	CoSc3034	Wireless Communication and Mobile Computing	5	3	2	3	1
2.	CoSc3112	Introduction to Artificial Intelligence	5	3	2	3	2
3.	CoSc3094	Design and Analysis of Algorithms	5	3	3	0	0
4.	CoSc3026	Real Time and Embedded Systems	5	3	2	3	2
5.	CoSc3072	Computer Graphics	5	3	2	3	1
6.	CoSc3122	Industrial Practice	3	2	0	0	0
7.	MGMT3102	Entrepreneurship & Business Development	5	3	3	0	0
Sub Total			**33**	**20**	**14**	**12**	**6**

7. Year 4 Semester 1

No.	Course Code	Course Title	ECTS	Cr.Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	CoSc4035	Computer Security	5	3	2	3	1
2.	CoSc4113	Computer Vision and Image Processing	5	3	2	3	2
3.	CoSc4123	Research Methods in Computer Science	3	2	2	0	0
4.	CoScXXXX	Elective I	5	3	2	3	1
5.	CoSc4103	Compiler Design	5	3	2	3	2
6.	CoSc4125	Final Year Project I	5	3	0	0	0
Sub Total			**28**	**17**	**10**	**12**	**6**

8. Year 4 Semester 2

No.	Course Code	Course Title	ECTS	Cr.Hrs.	Lec. Hrs.	Lab. Hrs.	Tut. Hrs.
1.	CoSc4036	Network and System Administration	5	3	2	3	1
2.	CoSc4038	Introduction to Distributed Systems	5	3	2	3	2
3.	CoSc4132	Selected Topics in Computer Science	5	3	3	0	0
4.	CoScXXXX	Elective II	5	3	2	3	1
5.	CoSc4126	Final Year Project II	5	3	0	0	0
	Sub Total		**25**	**15**	**9**	**9**	**4**

13. Course Syllabi

13.1. Compulsory Computer Science Courses

<table>
<tr><td colspan="3">DEBRE BERHAN UNIVERSITY
Institute of Technology</td><td></td><td colspan="3">Computing College
Department of Computer Science</td></tr>
<tr><td colspan="7">Department: Computer Science</td></tr>
<tr><td colspan="5">Course Title: Computer Programming</td><td colspan="2">Course Code: CoSc1012</td></tr>
<tr><td rowspan="2">Course Load:</td><td>ECTS</td><td>Credit</td><td>Lecture hrs.</td><td>Laboratory hrs.</td><td colspan="2">Tutorial hrs.</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>3</td><td colspan="2">1</td></tr>
<tr><td>Course Prerequisite:</td><td colspan="6">None</td></tr>
<tr><td>Course Category:</td><td colspan="6">Compulsory</td></tr>
<tr><td colspan="3">Instructor’s Contact Information:</td><td colspan="4">Course Delivery Information:</td></tr>
<tr><td colspan="3">Name: _____
Office: _____
Phone: _____
Email: _____
Office Hours: _____</td><td colspan="4">Academic Year: _____
Year/Semester: I/II
Meeting date: _____
Meeting time: _____
Meeting location: _____</td></tr>
</table>

Course Description

This course teaches problem solving using computers, algorithms, program structure, constants, types, variables, reserved words, syntax diagram, identifiers, numbers, character strings and constant declarations; basic data types, statements (assignment, I/O, control)

Course objectives

On completion of the course successfully, students will be able to:

- Apply programming skills to solve problems
- Understand basic concepts in computer science such as Boolean logic and problem decomposition
- Learn control structures (such as ‘if’ and ‘for’ statements)
- Understand programming concepts that will assist in learning other languages (like Java, Perl, or C#)
- Learn about computing resources on campus and online
- Analyze simple problems and formulate solutions
- Develop computer programs for quality program solving
- Practice good programming disciplines and styles

Course outline

Chapter 1: Introduction

1.1. Introduction to programming

1.2. Problem solving techniques

1.2.1. Flowchart

1.2.2. Pseudo code

1.2.3. Algorithms

Chapter 2: Basics of programming

2.1. Structure of a Program

2.2. C++ IDE

2.3. Showing Sample program

2.4. Keywords, Identifiers, Inputs, Outputs, Comments, Parts of a program

2.5. Data Types

2.6. Variables

2.7. Constants

2.8. Operators

2.8.1. Assignment Operators

2.8.2. Compound Assignment Operators

2.8.3. Arithmetic Operators

2.8.4. Relational Operators

2.8.5. Increment and Decrement Operators

2.8.6. Infix and postfix types

2.8.7. Precedence of Operators

Chapter 3: Control Statements

3.1. If…. else statement

3.2. If… elseif… else statement

3.3. Switch statement

3.4. For loop statement

3.5. While loop statement

3.6. Do…while statement

3.7. Jumping Statement

Chapter 4: Introduction on Function and Array

4.1 Definition of function

4.2 Declaration of function

4.3 Definition of Array

4.4 Declaration of Array

Teaching-learning methods

Two contact hours of lectures, three contact hours of lab and 1 contact hour of tutorials per week.

Assessment methods

- Assignments/quizzes 10%
- Lab exams/Project 20%
- Mid semester examination 20%
- Final examination 50%

References:

1. Ravichandran; "Problem Solving with C++", Tata Mc. Grew Hill Company

2. Thinking in C++, Volume 2: Practical Programming, Bruce Eckel, President, MindView, Inc., Chuck Allison, Utah Valley State College

3. E.Balagurusamy, "Programming with C++", Tata Mc. Grew Hill Company

Laboratory Course Outline

Week 1

- Lab Environment setup
- Building blocks of a code
- First code "Hello, World"

Week 2

- Data types and variables
- Using variables and constants
- Statements

Week 3-6

- Operators
- Basic arithmetic operators
- Arithmetic and logical operations

Week 7-9

- If
- If…else
- If...elseif...else
- Nested if ...else statements
- Switch statement

Week 10-12

- For loop statement
- While loop statement
- Do…while statement
- Nested loops

Week 13

- Definition of function
- Declaration of function
- One-dimensional array

<table>
<tr><td colspan="2">DEBRE BERHAN UNIVERSITY
Institute of Technology</td><td colspan="2">  </td><td colspan="3">Computing College
Department of Computer Science</td></tr>
<tr><td colspan="6">Department: Computer Science</td></tr>
<tr><td colspan="4">Course Title: Fundamental of Programming in C++</td><td colspan="2">Course Code: CoSc2015</td></tr>
<tr><td rowspan="2">Course Load:</td><td>ECTS</td><td>Credit</td><td>Lecture hrs.</td><td>Laboratory hrs.</td><td>Tutorial hrs.</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>3</td><td>1</td></tr>
<tr><td>Course Prerequisite:</td><td colspan="5">Computer Programming (CoSc1012)</td></tr>
<tr><td>Course Category:</td><td colspan="5">Compulsory</td></tr>
<tr><td colspan="3">Instructor’s Contact Information:</td><td colspan="3">Course Delivery Information:</td></tr>
<tr><td colspan="3">Name: _____
Office: _____
Phone: _____
Email: _____
Office Hours: _____</td><td colspan="3">Academic Year: _____
Year/Semester: II/I
Meeting date: _____
Meeting time: _____
Meeting location: _____</td></tr>
</table>

1. Course Description

The course is designed to familiarize on C++ programming by providing programming concepts on creating and working computer programs in C++. It helps us to solve business problems through the technique of structural programming. The course is also dealing with modular programming and abstract data types; which covers primitive data types, pointers, string processing, Functions and parameter passing, including recursion; file input output, use data structure elements in the programs.

2. Objective

At the end of this course the students will able to:

- To use Arrays, string and pointer, Functions and File concepts in solving problems.
- To solve business problems using c++ programming.
- Apply the techniques of structured decomposition to break a program into smaller pieces.
- To write programs that use array and String data structures.
- To Explain the concept of recursion and to use pointer in c++ program
- To use file concepts in programming.

3. Course content

TOPIC
Chapter One: Functions 1.1 Definition, Declaration of function 1.2 Passing value of a function by Value 1.3 Passing value of a function by reference 1.4 Default Parameters 1.5 Global and Local Scope 1.6 Scope Operator 1.7 Function Overloading 1.8 Recursive Functions
Chapter Two: Arrays 2.1 Definition, Declaring, Initializing Arrays 2.2 Accessing Array Elements 2.3 Multi-dimensional array
Chapter Three: String and pointer ***3.2.*** String manipulation operations ***3.3.*** Declaring variables of pointer types 3.4. Reference operator (&) and Dereference operator (*) 3.5. Pointer Arithmetic 3.6. Address and pointer 3.7. Pointer and array 3.8. Pointer and function 3.9. Pointer and string
Chapter Four Structure in C++ 4.1. Specifying simple structure 4.2. Defining a structure variable 4.3. Accessing structure variable 4.4. Nested Structure
Chapter Five: File &File Management *4.5.* Introduction about files *4.6.* Basic file Operations

4. Summary of Teaching- Learning Methods:

The teaching-learning methodology will be student-centered with appropriate guidance of instructor/s during the students' activities. There will be Lecture, Demonstrations, Lab work Tutorials, Reading assignments and Group Discussions

- Lectures – Each chapter will be preceded by lectures to give the students a touch of the contents.
- Tutorials – Tutorial classes on some difficult topics will be offered wherein students will have the opportunity to ask questions and answer questions posed by the instructor and/or other students.
- Lab Works – Students will have lab practices on most of the topics covered.
- Projects – Students will be required to work on a design/implementation of a small to medium level networks for different organizations.

5. Assessment Methods

- Continuous Assessments (50%):
  - Attendance and Active participation 5%
  - Lab works/ Project/Assignments 30%
  - Tests/Quizzes 15%
- Final exam-50%

6. Required Material

- Hardware: Computer ,Software :Compiler of a high-level language such as Turbo C++, Falcon, Dev C++, Quincy, Visual C++ and windows operating system environment

7. Required Text

Text Book

- Walter Savitch, Problem solving with C++, 6th edition
- Deitel & Deitel, C++ How to Program Pearson

References:

- AL Stevens, Wiley's Teach Yourself C++, 7th Edition
- Robert Lafore, object Oriented Programming In C++, 4th ed
- E Balagurusamy, object Oriented Programming with C++, 5th ed
- D.P. Kothari and etal. , object Oriented Approach using C++.
- R Davis, Beginning Programming with C++ for Dummies; A Wiley Brand, 2nd Ed.
- Madhusudan Mothe, C++ programming A Practical Approach
- S.K. Pandey, Thinking in C++, 4th Edition,J.s.Offset printer Delh, India
- R. SUBBURAJ.C++ How to program, Fifth Edition
- https://www.cplusplus.com/doc/tutorial/

Laboratory Course Outline

Week 1

- Definition of function
- Declaration of function

Week 2

- Passing value of a function by Value
- Passing value of a function by reference

Week 3

- One-dimensional array

Week 4

- Multi-dimensional array

Week 5

- String

Week 6

- Pointer

Week 7

- Pointer and array

Week 8

- Pointer and function

Week 9

- Pointer and string

Week 10-12

- Specifying simple structure
- Defining a structure variable
- Accessing structure variable

Week 13

- File and file management

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Fundamentals of Database Systems				**Course Code:** CoSc2041	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	**None**				
Course Category:	**Compulsory**				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course description

This course is assumed to be the first course in database management systems. It starts by introducing what database is and database systems, and how it differs with the traditional file processing system. It then deals with data models, ER diagrams, database design methods, normalization, relational algebra and calculus, file organizations and storage management, index structure for files, and SQL statements. The course mainly emphasizes on basics of database systems how to retrieve and modify data. It also deals with different database environments.

Course objectives

This course introduces the students to the overview, design and implementation of database systems.

At the end of this course, students will be able to:

- Understand what database is, database system and DBMS
- Differentiate database system from file system
- Identify the pros and cons of manual approach, file based approach and database approach
- Understand the basic principles of database design systems using different database models
- Appreciate the use of database system in the real world.

- Design different types of databases
- Understand database normalization & functional dependency
- Understand the principles of relational database management systems and their languages
- Understand file organizations and storage management, and index structure for files
- Demonstrate queries in the relational algebra.
- Demonstrate queries in the tuple relational calculus.
- Create a relational database schema in SQL that incorporates key, entity integrity, and referential integrity constraints.

Course outline

Chapter 1: Introduction to Database Systems (2 hours)

1.1. Overview

1.2. Basics of Database

1.3. File organization verses Database approach

1.4. Users and actors of Database system

1.5. Characteristics of the Database Approach

1.6. Actors on the Scene

Chapter 2: Database System Architecture (2 hours)

2.1. Data models, Schemas, and Instances

2.2. Over view of data models

2.3. Architecture and Data Independence

2.4. Database Language and Interface

2.5. The Database System Environment

2.6. Classification of DBMS

Chapter 3: Database Modeling (6 hours)

3.1. The Entity Relationship (ER) Model

3.1.1. The high-level conceptual model

3.1.2. Entities, Attributes, and Keys

3.1.3. Relationships, Associations, and Constraints

3.1.4. The ER Diagrams

3.1.5. Mapping ER-models to relational tables

3.2. Enhanced Entity Relationship (EER) Model

3.2.1. Inheritance

3.2.2. Union

3.2.3. Aggregation and Association

3.2.4. Mapping EER model to relational model

3.3. The Relational Database Model

3.3.1. The Relational Model Concepts

3.3.2. The Relational Constraints and Relational Database Schemas

3.3.3. The Relational Operations

Chapter 4: Functional Dependency and Normalization (4 hours)

4.1. Functional Dependency

4.2. Normal Forms

4.2.1. First Normal Form

4.2.2. Second Normal Form

4.2.3. Third Normal Form

4.2.4. Boyce Codd Normal Form

Chapter 5: Record Storage and Primary File Organization (6 hours)

5.1. Introduction

5.2. Operations on Files

5.3. Files of Unordered Records (Heap Files)

5.4. Files of Ordered Records (Sorted Files)

5.5. Hashing Techniques

5.6. Index Structure for Files

5.7. Types of Single Level Ordered Index

5.8. Dynamic Multilevel indexes using B-Trees and B+ Trees

5.9. Indexes on Multiple Indexes

Chapter 6: The Relational Algebra and Relational Calculus (5 hours)

6.1. Introduction

6.2. Relational Algebra

6.3. The Relational Calculus

Chapter 7: The SQL Language (7 hours)

7.1. Structured Query Language

7.2. Datatypes

7.3. DDL, DML, TCL and DCL

7.4. Basic Queries in SQL

7.5. Nested Queries in SQL

7.6. Views

7.7. Comments

7.8. Constraints

Evaluation Schemes

(This may vary on the number of students per class, but general evaluation scheme is as below)

- Quiz 10%
- Mid Exam 30%
- Lab Evaluation and Project Work 20%
- Final Exam 40%

Text books and References:

Textbook:

1. Raghu Ramakrishnan, Johannes Gehrke. Database Management Systems, McGraw-Hill; 3rd edition, 2002
2. Elmasri, R., & Navathe, S. (2017). *Fundamentals of database systems* (7th Edition). Pearson.

References

1. Osama Mustafa, Robert P. Lockard. (2019). Oracle Database Application Security, Apress, Berkeley, CA.
2. C. J. Date. (2019). Database Design and Relational Theory. 2nd Edition. Apress, Berkeley, CA.
3. Anthony Hack. (2019). SQL Computer Programming for Beginners. Independently published

Laboratory Course Outline

Week1: Database modeling

Week 2: Introduction and Software Installation

1.1. (Microsoft SQL Server or Oracle DB)

1.2. Data Definition Language

1.3. Data definition and data types in SQL

Week 3: Data Manipulation Language

1.4. Specifying Constraints in SQL

1.5. Querying from tables (insert, select, delete, update)

Week 4: More Complex SQL Retrieval Queries 1

1.6. Sorting (ascending, descending) using ORDER BY, DESC and ASC

1.7. group by, order by, having, wildcards, and regular expressions

2. **Week 5: More Complex SQL Retrieval Queries 2**

2.1. Aggregate Functions in SQL

2.2. Null value & Keywords in SQL

2.3. Auto Increment, alter, drop, rename in SQL

3. **Week 6: More Complex SQL Retrieval Queries 3**

3.1. Joins

4. **Week 7: More Complex SQL Retrieval Queries 4**

4.1. Unions, intersections, differences

5. **Week 8: Views**

6. **Week 9: SQL Functions 1**

6.1. String Functions

7. **Week 10: SQL Functions 2**

7.1. Numeric/Math Functions

8. **Week 11: SQL Functions 3**

8.1. Date/Time Functions

9. **Week 12: SQL Functions 4**

9.1. Conversion Functions

10. **Week 13: SQL Functions 5**

10.1. Advanced Functions in SQL

11. **Week 14: Complex SQL Queries**

12. **Week 15: File Organization and Indexes**

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Advanced Database Systems				**Course Code:** CoSc2042	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Fundamentals of Database Systems (CoSc2041)				
Course Category:	**Compulsory**				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course description

This course deals with query optimization, transaction management, recovery and concurrency control, database authorization and security. Additional topics including object oriented and object relational database systems, distributed databases, and integration may also be covered. A major component of the course is a database implementation project using current database languages and systems.

Course objectives

At the end of this course, students will be able to:

- Describe the main concepts of the OO model such as object identity, type constructors, encapsulation inheritance, polymorphism, and versioning
- Evaluate a set of query processing strategies and select the optimal strategy. Know the basics of transaction management and concurrency control
- Understand database security
- Use different recovery methods when there is a database failure
- Design a distributed database system in homogenous and heterogeneous environments

Course outline

Chapter 1: Concepts for Object-Oriented Databases (2 hours)

1.1. Overview of Object-Oriented Concepts

1.2. Object Identity, Object Structure, and Type Constructors

1.3. Encapsulation of Operations, Methods, and Persistence

1.4. Type Hierarchies and Inheritance

Chapter 2: Query processing and Optimization (4 hours)

2.1. Translating SQL Queries into Relational Algebra

2.2. Basic Algorithms for Executing Query Operations

2.3. Using Heuristic in Query Optimization

2.4. Using Selectivity and Cost Estimates in Query Optimization

2.5. Semantic Query Optimization

Chapter 3: Transaction Processing Concepts (6 hours)

3.1. Introduction

3.2. Transaction and System Concepts

3.3. Properties of Transaction

3.4. Schedules and Recoverability

3.5. Serializability of Schedules

3.6. Transaction Support in SQL

Chapter 4: Concurrency Control Techniques (6 hours)

4.1. Locking Techniques for Concurrency Control

4.2. Concurrency Control Based ON Timestamp Ordering

4.3. Multi-version Concurrency Control Techniques

4.4. Validation (Optimistic) Concurrency Control Techniques

4.5. Granularity of Data Items and Multiple Granularity Locking

4.6. Using Locks for Concurrency Control in Indexes

Chapter 5: Database Recovery Techniques (5 hours)

5.1. Backup and Recovery Concepts

5.2. Recovery Concepts Based on Deferred Update

5.3. Recovery Concepts Based on Immediate Update

5.4. Shadow Paging

5.5. The ARIES Recovery Algorithm

5.6. Recovery in Multi database Systems

Chapter 6: Database Security and Authorization (5 hours)

6.1. Introduction to DB Security Issues

6.2. Discretionary Access Control Based on Granting /Revoking of Privileges

6.3. Mandatory Access Control for Multilevel Security

6.4. Statistical DB Security

Chapter 7: Distributed Database System (4 hours)

7.1. Distributed Database Concepts

7.2. Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design

7.3. Types of Distributed Database Systems

7.4. Query Processing in Distributed Databases

Evaluation Schemes

(This may vary on the number of students per class, but general evaluation scheme is as below)

- Quiz 10%
- Mid Exam 30%
- Lab Evaluation and Project Work 20%
- Final Exam 40%

Text books and References:

Textbook:

1. Raghu Ramakrishnan, Johannes Gehrke. Database Management Systems, McGraw-Hill; 3rd edition, 2002
2. Elmasri, R., & Navathe, S. *Fundamentals of database systems* (7th Edition). Pearson. (2017).

References

1. Osama Mustafa, Robert P. Lockard. (2019). Oracle Database Application Security, Apress, Berkeley, CA.
2. C. J. Date. (2019). Database Design and Relational Theory. 2nd Edition. Apress, Berkeley, CA.
3. Anthony Hack. (2019). SQL Computer Programming for Beginners. Independently published

Laboratory Course Outline

Week 1: Introduction and Software Installation

1.1. (Microsoft SQL Server or Oracle DB)

Week 2: Objet-Oriented Database

2.1. Object Identity

2.2. Object Query Language (OQL)

Week 3: Query Processing and Optimization

3.1. Query Execution Plan

3.2. Query Optimization

Week 4: Transaction Management

3.3. Basic Syntax of Transactions

3.3.1. What are Transactions

3.3.2. Beginning Transaction

3.3.3. Committing or Rolling Back

3.3.4. Creating Named Transactions

Week 5: Transaction Management

3.4. Making Use of Transactions

3.4.1. Conditionally Committing or Rolling Back

3.4.2. Transactions with Error Handlers

Week 6: Transaction Management

3.4.3. Automatic Rollback

3.4.4. Nested Transactions

Week 7: Transaction Management

3.4.5. Using Save points

3.4.6. Transactions in Stored Procedures

Week 8: Concurrency Control Techniques

4.1. Locking

4.2. Timestamping

Week 9: Concurrency Control Techniques

4.3. Multi-version Concurrency Control

4.4. Locks for Indexes

Week 10: Database Recovery Techniques

5.1. Backup and Recovery Concepts

5.2. Backup

5.3. Recovery

Week 11: Database Security and Authorization

6.1. List the different Types of Accounts in SQL Server or Oracle DB

6.2. Explain the use of Server Roles

6.3. Demonstrate how to Grant and Deny Permissions

6.4. Describe Database Roles

6.5. Describe How to Work with Database Permissions

Week 12: Distributed Database

7.1. Distributed Database Concepts

7.2. Data Fragmentation

7.3. Replication

7.4. Allocation Techniques

7.5. Query Processing in Distributed Databases

Week 13: Triggers

8.1. Triggers

Week 14: Stored Procedures

8.2. Stored Procedures

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Software Engineering				**Course Code:** CoSc3061	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	2
Course Prerequisite:	None				
Course Category:	**Compulsory**				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: III/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

This course provides an introduction to the problems of software development and maintenance and the processes and methods used to address them. All phases in the software development life cycle will be introduced. The course also deals with software project planning, cost estimation, tracking and control, staffing, risk management, and software configuration plan.

Covers O-O concepts, tools, development life cycle, problem solving, modeling, analysis, and design, while utilizing UML (Unified Modeling Language) for O-O modeling. UML has become the standard notation for modeling O-O systems and is being embraced by major software developers like Microsoft and Oracle.

Course objectives

On completion of the course successfully, students will be able to:

- Understand the basic principles of Software Engineering
- Write requirements specification documents
- Design a system, component, or process to meet desired needs.
- Verify and validate a Software system practice with effective communication skill.
- Describe in detail the theory, concepts and methods pertaining to the Unified Modeling Language (UML).
- Create requirements using use case modeling concepts.
- Demonstrate conceptual and technical skills in the analysis, design and implementation of a software system using Object Oriented Concepts.

- Employ tools and techniques for Object Oriented Software Engineering,
- Demonstrate an ability to adapt and solve problems in software development activities from specification to testing individually and as part of a team.

Course outline

Chapter 1: Introduction (6 hrs)

1.1. Two Orthogonal view of software.

1.2. Software development process models

1.2.1. Software Process

1.2.2. Software life cycle and process models

1.2.3. Process assessment models

1.2.4. Software process metrics

1.3. Object oriented system development methodology.

1.3.1. Why an object oriented

1.3.2. Overview of the unified approach.

1.3.3. An object-oriented philosophy

1.3.4. Basic concepts of an object

1.3.5. Attributes of an object, its state and properties.

Chapter 2: Unified Modeling Language (UML) (8 hours)

2.1. Where Can the UML Be Used

2.2. Building Blocks of the UML.

2.3. Relationships in the UML

2.4. Diagrams in the UML.

2.4.1. Use Case Diagrams

2.4.2. Class Diagrams

2.4.3. Sequence diagrams

2.4.4. State chart diagrams

2.4.5. Activity diagrams

2.4.6. Component diagram

2.4.7. Deployment diagram

2.4.8. Diagram extensions

Chapter 3: Requirements Elicitation (6 hours)

3.1. An overview of requirements elicitation.

3.2. Requirement's elicitation concepts

3.2.1. Functional requirements

3.2.2. Nonfunctional and pseudo requirements

3.2.3. Levels of description

3.2.4. Correctness, completeness, consistency, clarity, and realism

3.2.5. Verifiability and traceability

3.3. Requirement's elicitation activities.

3.3.1. Identifying actors

3.3.2. Identifying scenarios

3.3.3. Identifying use cases

3.3.4. Refining use cases

3.3.5. Identifying relationships among actors and use cases

3.3.6. Identifying initial analysis objects

3.3.7. Identifying nonfunctional requirements

3.4. Managing requirements elicitation

3.4.1. Eliciting information from users:

3.4.2. Validating requirements: Usability testing

3.4.3. Documenting requirements elicitation

Chapter 4: Software Project management (6 hours)

4.1. Responsibility of Software Project Managers

4.2. Project Planning

4.3. The organization of SPMP document

4.4. Project Size Estimation Metrics

4.5. Project Estimation Techniques

4.6. Scheduling, Organization and Team Structures

4.7. Staffing

4.8. Risk Management

4.9. Quality Assurance

4.10. Project Monitoring Plans

Chapter 5: Analysis (8 hours)

5.1. Analysis Concepts

5.1.1. Entity, Boundary, and Control Objects

5.1.2. Association Multiplicity Revisited

5.1.3. Qualified Associations

5.1.4. Generalization

5.2. Analysis Activities: From Use Cases to Objects

5.2.1. Identifying Entity Objects

5.2.2. Identifying Boundary Objects

5.2.3. Identifying Control Objects

5.2.4. Modeling Interactions between Objects: Sequence Diagrams

5.2.5. Identifying Associations.

5.2.6. Identifying Attributes

5.2.7. Reviewing the Analysis Model

Chapter 6: Object Oriented System Design (8 hours)

6.1. An overview of system design.

6.1.1. System design concepts.

6.1.2. System design activities: From objects to subsystems

6.1.3. Documenting system design

6.1.4. An overview of object design

6.1.5. Object design concepts

6.1.6. Object design activities

6.1.7. Managing object design

6.1.8. Documenting object design

Chapter 7: Software Quality Assurance (6 hours)

7.1. An overview of testing

7.2. Testing concepts

7.3. Testing activities

7.4. Managing testing

7.5. Impact of object-oriented testing

7.6. Types of Testing

Text Book

1. Brahmin, Ali (1999), Object oriented System development, McGraw Hill, USA.

References

1. Martina Seidl, Marion Scholz, Christian Huemer, Gerti Kappel. UML @ Classroom: An Introduction to Object-Oriented Modeling. 2012. Springer International Publishing AG.
2. Scott, Kendall (2004) Fast Track UML 2.0 Apress USA
3. Booch, Grady Rumbaugh, James Jacobson, Ivar (2005) The Unified Modeling Language User Guide second edition Addison Wesley Professional USA

Evaluation Schemes

(This may vary on the number of students per class, but general evaluation scheme is as below)

- Quizzes, assignments and tests 10%
- Mid Exam 20
- Projects 20%
- Final Exam 50%

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Object Oriented Programming				**Course Code:** CoSc2051	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Computer Programming (CoSc1012)				
Course Category:	**Compulsory**				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course description

This programming course emphasizes the methodology of programming from an object-oriented perspective and software engineering principles. It allows students to develop the ability to analyze programming problems and design and document suitable solutions and to implement reliable and robust software using contemporary program design methods. Topics to be dealt with are: classes: data abstraction, information hiding, overloading; inheritance; polymorphism; exceptions handling.

Course objectives

Upon successful completion of the course, students will be able to:

- Explain the basic object oriented concepts
- Successfully code, debug and run programs with appropriate development environment
- Work on more advanced programs
- Have clear differentiation between structural and object oriented programming paradigms

Course outline

Chapter 1: Introduction to Object-Oriented Programming (4 hrs)

1.1. Types of programming paradigms

1.2. Overview of OO principles

1.3. Editing, Compiling and Interpreting

Chapter 2: Objects and Classes (6 hrs)

- 2.1. Defining a class
- 2.2. Creating an Object
- 2.3. Instantiating and using objects
  - 2.3.1. Printing to the Console
  - 2.3.2. Methods and Messages
  - 2.3.3. Parameter Passing
  - 2.3.4. Comparing and Identifying Objects
  - 2.3.5. Destroying Objects
  - 2.3.6. Enumerated Types
- 2.4. Instance fields
- 2.5. Constructors and Methods
- 2.6. Access Modifiers
- 2.7. Encapsulation

Chapter 3: Inheritance and Polymorphism (8 hrs)

- 3.1. Inheritance
- 3.2. Casting
- 3.3. Method Overriding and Overloading
- 3.4. Polymorphism
- 3.5. Super
- 3.6. The Object Class
- 3.7. Abstract Classes
- 3.8. Interfaces
- 3.9. Using Interfaces

Chapter 4: Exception Handling (4 hrs)

- 4.1. Exceptions Overview
- 4.2. Catching Exceptions
- 4.3. The finally Block
- 4.4. Exception Methods
- 4.5. Declaring Exceptions
- 4.6. Defining and Throwing Exceptions
- 4.7. Errors and Runtime Exceptions

Chapter 5: Packages (4 hrs)

5.1. Packages

5.2. The import Statement

5.3. Static Imports

5.4. CLASSPATH and Import

5.5. Defining Packages

5.6. Package Scope

Chapter 6: Data structures (6 hrs)

6.1. The Set

6.2. Set Implementation Classes

6.3. The List

6.4. List Implementation Classes

6.5. The Queue

6.6. Queue Implementation Classes

6.7. Map/ dictionary

Teaching- learning methods

Two contact hours of lectures, three hours of lab and two hours of tutorials per week.

Assessment methods

- Quiz/ Assignment 10%
- Lab Exam/Project 20%
- Mid Exam 20%
- Final Exam 50%

Text book

1. H.M. Deitel, P.J. Deitel, Java How to Program. 8th ed. Prentice Hall
2. Eckel, Bruce. Thinking in Java. 4th Ed. New Jersey: Prentice Hall

Laboratory Outline

Week 1: Introduction to Object-Oriented Programming

- Software Installation and Environment Setup

Week 2-4: Basics of Programming

- Variable types and identifiers
- Number types, strings, constants
- Operators and operator precedence

- Type Conversion/ Casting Chapter
- **Decision Statements**
    - If statement
    - Switch statement
- **Looping Statements**
    - For loop
    - While, Do while loop

Week 5: Objects and Classes

- Defining a class
- Creating an Object
- Instantiating and using objects

Week 6: Objects and Classes

- Instance fields
- Constructors and Methods

Week 7: Objects and Classes

- Access Modifiers
- Encapsulation

Week 8: Inheritance

- Inheritance
- Casting
- Method Overriding and Overloading

Week 9: Polymorphism and Abstract

- Polymorphism
- Super
- The Object Class
- Abstract Classes

Week 10: Interfaces

- Interfaces
- Using Interfaces

Week 11: Exception Handling

- Exceptions Overview
- Catching Exceptions

- The finally Block
- Exception Methods
- Declaring Exceptions
- Defining and Throwing Exceptions
- Errors and Runtime Exceptions

Week 12: Packages

- Packages
- The import Statement
- Static Imports
- CLASSPATH and Import
- Defining Packages
- Package Scope

Week 13: Data structures

- Set
- List
- Stack & Queue
- Map/Dictionary

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Data Communication and Computer Networks				**Course Code:** CoSc2032	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	None				
Course Category:	**Compulsory**				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course description

This course will explore the various types of data communication systems, networks and their applications. Concepts & terminologies like computer networks, layered architecture (OSI & TCP/IP), network hardware, network software, standardization, network medium, and IP addressing will be explored. The practical aspect will deal with building small to medium level networks including Cabling, Configuring TCP/IP, Peer to Peer Networking, Sharing resources, Client Server Networking.

Course objectives

- By the end of this course, students will be able to:
- Understand the concepts and principles of data communications and computer networks
- Understand data transmission and transmission media
- Understand Protocols and various networking components
- Understand TCP/IP & OSI Reference Model
- Understand LAN and WAN technologies
- Understand and implement IP addressing.
- Build small to medium level Computer networks
- Understand subnets

Course outline

Chapter 1: Data Communication and Computer Networking Basics (5 hours)

1.1 Data Communication

- 1.1.1 Definition of Data Communication
- 1.1.2 Communication Basics
- 1.1.3 Data Representation techniques
- 1.1.4 Digital Data Transmission formats
- 1.1.5 Transmission Impairments
- 1.1.6 Modes of Data transmission
- 1.1.7 Elements of Data Communication
- 1.1.8 Protocols and standards
- 1.1.9 Circuit switching and Packet switching,

1.2 Computer Network

- 1.2.1 Network Definition
- 1.2.2 Network Applications
- 1.2.3 Network Types
  - 1.2.3.1 Geographical Area
    - 1.2.3.1.1 PAN
    - 1.2.3.1.2 LAN
    - 1.2.3.1.3 MAN
    - 1.2.3.1.4 WAN
  - 1.2.3.2 Architecture
    - 1.2.3.2.1 Peer-to-Peer
    - 1.2.3.2.2 Client/server
- 1.2.4 Network Components
  - 1.2.4.1 Hardware Components
  - 1.2.4.2 Software Components
- 1.2.5 Network Topology
  - 1.2.5.1 Physical
  - 1.2.5.2 Logical
- 1.2.6 Network Models
  - 1.2.6.1 OSI Reference Model

1.2.6.2 TCP/IP Protocol Suite

1.3 Transmission Media

1.3.1 Guided

1.3.1.1 Twisted Pair Cable

1.3.1.2 Coaxial Cable

1.3.1.3 Fiber Optics/Optical Fiber Cable

1.3.2 Unguided

1.3.2.1 Wireless LAN

1.3.2.2 Radio Communication

1.3.2.3 Microwave Communication

1.3.2.4 Infrared Communication

1.3.2.5 Wi-Fi

1.3.2.6 Bluetooth Technology

1.3.2.7 Satellite communication

Chapter 2: Application, Session and Presentation Layers (5 hours)

2.1. Application Layer Introduction

2.2. Client-Server Model

2.3. Application Protocols

2.4. Network Services

2.5. Session Layer

2.6. Presentation Layer

Chapter 3: Transport Layer (6 hours)

3.1. Segmentation

3.2. Addressing

3.3. Multiplexing and DE-multiplexing

3.4. Connectionless/Connection-Oriented

3.5. Unreliable/ Reliable

3.6. Protocols in Transport Layer

3.6.1. UDP

3.6.2. TCP

3.6.2.1. Flow control

3.6.2.2. Error Control

3.6.2.3. Congestion control

3.6.2.4. TCP Variants

Chapter 4: Network Layer Addressing and Routing (8 hours)

4.1. NIC addressing

4.2. Packetizing

4.3. IP addressing

4.3.1. IPv4

4.4. Sub-netting,

4.4.1. Classfull Addressing

4.4.2. Classless Inter Domain Routing(CIDR)

4.4.3. Private and Public IP addresses

4.4.4. NAT

4.4.5. PAT

4.5. Address Mapping

4.5.1. Logical to Physical Address Mapping –ARP

4.5.2. Physical to Logical Address Mapping –RARP

4.6. ICMP:

4.6.1. Types of Messages

4.6.2. Message Format

4.1.1. Error Reporting and Query

4.1.2. ICMPv6

4.7. IGMP:

4.7.1. Group Management

4.7.2. IGMP Messages

4.7.3. Message Format

4.7.4. IGMP Operation

4.7.5. Encapsulation

4.7.6. Netstat

4.8. Routing and forwarding

4.1.3. Routing algorithms

4.1.4. Routing in the Internet

4.1.5. Unicasting, Multicasting and Broadcasting

4.9. IPv6

4.9.1. structure

4.9.2. Address space

Chapter 5: Link Layer and Physical Layer (8 hours)

5.1. Link layer services

5.1.1. Faming

5.1.2. Multiple Access Protocols

5.1.2.1. CSMA/CD and CSMA/CA

5.1.3. Link layer addressing

5.1.3.1. MAC address

5.1.4. Data Link Sub Layers

5.1.4.1. Logical Link Control(LLC) and Data Link Control

5.1.5. Data Link and its responsibilities

5.1.5.1. Data Link Control,

5.1.5.2. Error detection and correction

5.1.5.3. Data Link Layer Protocols

5.2. Physical Layer Services

5.2.1. Bits

5.2.2. Ethernet,

5.2.3. Point-to-Point Protocol

5.2.4. LAN Devices: Repeaters, Hubs, Bridges and switches

5.2.5. WAN Devices Routers, Layer 3 Switches and Gateways

5.2.6. Signaling and encoding

5.2.6.1. Signal Encoding Techniques

5.2.7. Physical Layer and its responsibilities

Teaching-learning methods

Two contact hours of lectures, three contact hours of lab and two hours of tutorials per week.

Assessment methods

- Assignments/quizzes 15%
- Lab Assessments 15%
- Mid semester examination 20%
- Final examination 50%

Textbooks:

1. Data Communications and Networking, 5th Edition, Behrouz A. Forouzan

Reference books:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks (5th Edition), Pearson; 2010.
2. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014

Laboratory Outline

Week 1: Designing cables

1.1. Crossover cable

1.2. Straight-through cable

1.3. Rollover cable

Week 2: Creating Peer to Peer network

2.1. Building a Switched based network

2.2. Sharing Files and Printers between Windows OSs

2.3. Sharing Files between Windows OSs

Week 3: Study of IPv4 Address

3.1. Classification of IP Addresses

3.2. Subnetting

3.3. Supernetting

3.4. NIC addressing

Week 4: Study of Basic Network Configuration commands

4.1. ping

4.2. tracert/traceroute

4.3. ifconfig/ipconfig

4.4. netstat

4.5. telnet

4.6. ssh

4.7. ftp

4.8. nslookup

4.9. pathping

Week 5: Configuring a Switch

Week 6: Configuring a VLAN

Week 7: Configuring a Router

Week 8: Configuring NAT

Week 9: Configuring Routing Information Protocol (RIPv2)

Week 10: Configuring Interior Gateway Protocol (IGRP)

Week 11: Configuring Open Shortest Path First (OSPF)

Week 12: Configuring Enhanced Interior Gateway Routing Protocol (EIGRP)

Week 13: Configuring Border Gateway Protocol (BGP)

Week 14: Configuring Intermediate System-to-Intermediate System (IS-IS)

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: *Computer Science*					
Course Title: Operating System				**Course Code:** CoSc3023	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Computer Organization and Architecture (CoSc2022)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

What is an Operating System, history of operating system, operating system zoo; process concept, process scheduling, inter-process communication; threads; CPU scheduling, basic concepts, scheduling criteria, scheduling algorithms; process synchronization, the critical section problem, semaphores, monitors, classical synchronization problems; deadlocks, avoidance, prevention, detection; memory management, physical and virtual memory, swapping, allocation, paging, segmentation; file systems, access methods, directory structure, file sharing and protection; security, authentication, intrusion detection, encryption.

Course Objectives

By the end of this course, students will be able to:

- Explain the objectives and functions of modern operating systems
- Describe the functions of a contemporary operating system with respect to convenience,
- efficiency, and the ability to evolve.
- Explain the different states that a task may pass through and the data structures needed to support
- the management of many tasks.
- Explain conditions that lead to deadlock.
- Compare and contrast the common algorithms used for both preemptive and non-preemptive

- scheduling of tasks in operating systems, such as priority, performance comparison, and fair-
- share schemes.
- Explain the concept of virtual memory and how it is realized in hardware and software

Course outline

Chapter 1: Introduction (4hr)

1.1. Role and purpose of operating systems

1.2. History of operating system development

1.3. Types of operating systems

Chapter 2: Processes and process management (7hr)

2.1. Process and Thread

2.2. The concept of multi-threading

2.3. Inter process communication

2.3.1. Race conditioning

2.3.2. Critical Sections and mutual exclusion

2.4. Process Scheduling

2.4.1. Preemptive and Computer organization and Architecture

non preemptive scheduling

2.4.2. Scheduling policies

2.5. Dead lock

2.5.1. Deadlock prevention

2.5.2. Deadlock detection

2.5.3. Deadlock avoidance

Chapter 3: Memory Management (7hr)

3.1. Over view of physical memory and memory management

3.1.1. Hardware overlays

3.1.2. Swapping

3.1.3. Partitioning

3.2. Paging and Segmentation

3.2.1. Page replacement and replacement policies

3.3. Working sets and thrashing

3.4. Caching

Chapter 4: Device Management (4hr)

4.1. Characteristics of parallel and serial devices

4.2. Buffering strategies

4.3. Direct memory access

4.4. recovery from failure

Chapter 5: File Systems (6hr)

5.1. Fundamental concepts on file

5.1.1. Data and meta data

5.1.2. Operations, organization and buffering in file

5.1.3. Sequential Vs Consequential data

5.1.4. Content and structure of directories

5.2. File system techniques

5.2.1. Partitioning

5.2.2. Mounting and unmounting

5.2.3. Virtual file system

5.2.4. Memory-mapped files

5.3. Special purpose file systems

5.3.1. Naming, searching and backup strategies

Chapter 6: Security and protection (4hr)

6.1. Overview of system security

6.1.1. Policies and mechanism of system security

6.2. System protection, authentication

6.2.1. Models of protection

6.2.2. Memory protection

6.2.3. Encryption

6.2.3. Recovery management

Teaching - Learning methods

Assessment method

Test #1	10%
Test # 2	10%
Final examination	35%
Assignments (two)	20%

Quizzes, reading assessment and tutorial contributions 15%

Lab Examination 10%

Total 100%

Teaching materials

Required Texts:

- Andrew Tanenbaum, Modern Operating Systems, 2nd Edition, USA,Prentice-Hall, 2001

Reference books:

- William Stallings, operating Systems: Internals and Design Principles, 5th Edition, Prentice-Hall, 2005
- Abraham Silberschatz, P.B. Galvin and G. Gagne, Operating Systems Concepts, 6 th Edition, John Wiley &Sons ,2006

Operating Laboratory Outline

Week1	Basics of UNIX commands
Week2	C Program to simulate UNIX commands
Week3	Shell Programming
Week4	C programs to implement Different Scheduling algorithm
Week5	Implementation of Semaphore
Week6	Implementation of Shared memory and IPC
Week7	Banker Algorithm for Deadlock Avoidance
Week8	Implementation of deadlock avoidance algorithms
Week9	Implementation of Memory allocation methods for Fixed partition First Fit Worst Fit Best Fit
Week10	Implementation of Page replacement algorithms FIFO LRU LFU
Week11	Implementation of File Allocation strategies Sequential Indexed Linked

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Java Programming				**Course Code:** CoSc3053	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Object Oriented Programming (CoSc 2051)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course covers topics on Java which includes: AWT and Swing, I/O Streams, Multi-threading, Network Programming, Java database connectivity (JDBC), RMI, and Introduction to Servlets.

Course Objectives

At the end of this course, students should be able to:

- Carry out design and development of complex elements, such as user interfaces, multiprocessing, and fault-tolerant components;
- Write TCP/IP Client Server applications using Sockets;
- Write Java applications using the JDBC to make database independent queries; and Call methods remotely.

Course Outline

Chapter 1: Overview of Java Programming (4hr)

1.1. Data types and variables

1.2. Arrays

1.3. Decision and Repetition statement

1.4. Exception Handling

1.4.1. Exception handling overview

1.4.2. Syntax

Chapter 2: Java Applet (2hr)

2.1. Overview of Java Applets

2.2. Java Applets Vs Java Application

Chapter 3: Java GUI using JAVAFX (8 hrs.)

3.1. JAVAFX architecture and Program structure

3.2. JAVAFX layout components

3.3. Basic UI controls

3.3.1. Event handlers

3.3.1. UI controls

3.4. Composite UI controls

3.5. Shapes

3.5.1. Color, Texts, Fonts

3.5.2. Lines, Circle, Rectangle

3.5.3. CSS styling

3.6. Properties and Bindings

3.7. Graphics and Animation

Chapter 4: Streams and File I/O (4hr)

4.1. Input output streams

4.1.1. Various stream classes

4.1.2. Using Streams

4.1.3. Object Streams

4.2. File management

Chapter 5: Multi-threading concept (4hr)

5.1. Thread vs process

5.2. Multiple threads

5.2.1. Thread priorities

5.2.2. Thread synchronization

Chapter 6: Networking in Java (3hr)

6.1. Networking overview

6.1.1. Types of connections

6.2. Socket programming

6.2.1. Socket, port and URI

6.2.2. Implementing Socket programming

6.3. Remote method invocation (RMI)

6.3.1. Overview of RMI

6.3.2. The RMI registry

6.3.3. The remote Interface

6.3.4. Implementing RMI

Chapter 7: Java - Database connectivity (4hr)

7.1. Introduction on database systems

5.1.1. Structured query language (SQL)

7.2. Basic JDBC programming concept

7.2.1. Populating database

7.2.2. Executing queries

7.2.3. Manipulating query results

Chapter 8: Servlets (3 hrs.)

8.1. Servlet overview and architecture

8.2. Handling HTTP methods (GET and POST requests)

8.3. Request redirecting

8.4. Multi-tier applications using JDBC from servlet

Teaching - Learning methods

Assessment method

Quizzes	20%
Assignments	20%
Project	20%
Final Exam	40%
Total	100%

Teaching materials

Required Texts:

- S. Horstmann and Gary Cornell, Core Java 2 – Volume II- Advanced Features, Sun Microsystems Press
- Harvey M. Deitel and Paul J. Deitel, Java How to Program, Deitel & Associates Inc. java.sun.com/docs/books/tutorial

Java Programming Laboratory Outline

Week1	Overview of Java Programming Variable declaration Athematic and logical operations
Week2	Java Conditional and loop statements
Week3	Java Applet
Week4	Java GUI JavaFX layout components
Week5 -6	Basic UI Controls Event handlers UI Controls
Week7	Composite UI controls
Week8-9	Shapes CSS styling Property bindings Graphics and Animation
Week10	File Input-Output BufferedWritter and BufferedReader DataInputStream and DataOutputStream
Week11	Multi-thread concept Extending Thread class Vs Implementing Runnable Interface Thread Synchronization
Week12	Socket Programming Components of Socket class and Its implementation Components of ServerSocket class and its implementation
Week13	Remote method invocation Architecture of RMI Implementing RMI
Week14	Java - Database Connectivity Database setup Creating a connecting to a database

	Creating and executing SQL statements
Week15	Java - Database Connectivity More on Querying Database Manipulating results of query statements
Week16	Servlet Servlet lifecycle Compiling and deploying servlet Accessing data from HTML form Client Request and Server Response HTTP codes

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Computer Organization and Architecture				**Course Code:** CoSc 2022	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	1
Course Prerequisite:	Digital Logic Design (EENG2041)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course introduces students to basic computer organization and architecture concepts. It covers: number systems, Boolean algebra, digital logic circuits and their design, simple machine architecture, genealogy of microprocessors, von Neumann architecture, the system bus model, data representation and manipulation, organization of instruction sets and program execution, microprocessor organization, memory organization, organization of input and output subsystem, I/O interface; instruction set design philosophies, parallel processing, symmetric multiprocessing and clustering; case study of at least two microprocessor families and other components of computing system.

Course Objectives

By the end of this course, students will be able to:

- Describe the basic structure and operation of a digital computer
- Explain in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- Identify different ways of communicating with I/O devices and standard I/O interfaces.
- Describe different performance enhancement of computer architecture
- Explain the basic structure of computer hardware & software
- Identify the processes involved in the basic operations of CPU

- Understand basic concepts of circuits and their design

Course Outline

Chapter 1: Introduction (4hr)

1.1. Logic gates and Boolean algebra

1.2. Combinational circute

1.3. Flip flops

1.4. Sequential circute

Chapter 2: Number system and codes (4hr)

2.1. Data types

2.2. Complements

2.3. Fixed- and floating-point representation

2.4. Codes

Chapter 3: Common digital components (6hr)

3.1. Integrated circute

3.2. Decoder, multiplexer and registers

3.3. Binary counter

3.4. Memory units

Chapter 4: Register Transfer Language and Micro Operations (6hr)

4.1. Register transfer languages

4.2. Bus and memory transfer

4.3. Arithmetic and logic operations

4.4. Shift micro-operations

Chapter 5: Basic Computer Organization and Design (6hr)

5.1. Instructional code

5.2. Computer Register

5.3. Computer Instructions

5.4. Timing and control

5.5. Memory reference instructions

5.6. Design of Basic computers

5.7. Design of accumulator logic

Chapter 6: Central processing unit (4hr)

- 6.1. General register organization
- 6.2. Stack organization
- 6.3. Instruction formats
- 6.4. Addressing modes
- 6.5. Data transfer and manipulation
- 6.6. Program control
- 6.7. Characteristics of RISC and CISC

Chapter 7: Memory Organization (6hr)

- 7.1. Memory Hierarchy
- 7.2. Main memory
- 7.3. Cache memory
- 7.4. Mapping functions
  - 7.4.1. Direct mapping
  - 7.4.2. Associative mapping
  - 7.4.3. Set associative mapping
- 7.5. External memory
  - 7.5.1. Magnetic disks
  - 7.5.2. RAID technology
  - 7.5.3. Optical disks
  - 7.5.4. Magnetic tapes

Chapter 8: Input-Output Organization (4hr)

- 8.1. Peripheral devices
- 8.2. Input-output interface
- 8.3. Asynchronous data transfer
- 8.4. Mode of transfer
- 8.5. Priority interrupts
- 8.5. Direct memory access (DMA)
- 8.6. Input-Output Controller (IOC)
- 8.6. Serial communication

Chapter 9: Pipeline and Vector Processing (4hr)

9.1. Pipeline

9.2. Parallel Processing

9.3. Arithmetic Pipeline

9.4. Instruction Pipeline

9.5. Vector Processing

9.6. Array Processing

Chapter 10: Multiprocessors (4hr)

10.1. Multiprocessor and its Characteristics

10.2. Interconnection Structures for Multiprocessor

10.3. Inter Processor Communication and Synchronization

Teaching - Learning methods

Assessment method

Test1, Test2	30%
Assignments	20%
Final Exam	50%
Total	100%

Teaching materials

Required Texts:

Text book:

- William Stalling, Computer Organization and Architecture: Designing for Performance, 7 th Edition, Prentice Hall, 2006

Reference books:

- Andrew S. Tannenbaum, Structured Computer Organization, 4 th Edition, Prentice Hall, 1999
- Mano M, Morris, Computer System Architecture, 3rd Edition, 1993
- B. Ram, Computer Fundamentals, Architecture and Organization, 2007

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Microprocessor and Assembly Language Programming				**Course Code:** CoSc 3025	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Computer Organization and Architecture (CoSc 2022)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course description

Microprocessor architecture; memory organization; assembly language programming; microprocessor assemblers; use of microprocessor boards; memory and I/O interfaces; programming peripherals; interrupt system programming; microprocessor system design and applications

Course objectives

On completion of the course, successful students will be able to:

- Become familiar with the basic components of 8086 instruction set architecture
- Inspect and modify 8086 processor registers and memory.
- Use assembler to develop and run assembly language programs.
- Identify registry, memory allocation, memory reference techniques, File processing, modular programming etc
- Identify how to interface serial and parallel I/O devices with a microprocessor
- Write code to process exceptions and interrupts,

Course outline

CHAPTER 1: INTRODUCTION TO MICROPROCESSORS (4hr)

1.1 Introduction to microprocessors

1.2 General architecture of microcomputer system

1.3 Evolution of Intel microprocessors

1.4 Architectural compatibility

1.5 Hardware and software

1.6 Review of the basic number systems and conversion between different number systems

CHAPTER 2:BASIC ARCHITECTURE OF THE 8088 & 8086 MICROPROCESSORS (4hr)

2.1 Internal architecture of the 8086/8088 microprocessors

2.2 Memory address space and data organization

2.3 Data types

2.4 Segment registers and memory segmentation

2.5 Pointer and index register

2.6 Status and flag register

2.7 The Stack

CHAPTER 3: ADDRESSING MODES (5hr)

3.1 Data-Addressing Modes

3.1.1 Register Addressing

3.1.2 Immediate Addressing

3.1.3 Direct Data Addressing

3.1.4 Register Indirect Addressing

3.1.5 Base-Plus-Index Addressing

3.1.6 Register Relative Addressing

3.1.7 Base Relative-Plus-Index Addressing

3.1.8 Scaled-Index Addressing

3.1.9 RIP Relative Addressing

3.1.10 Data Structures

3.2 Program Memory-Addressing Modes

3.2.1 Direct Program Memory Addressing

3.2.2 Relative Program Memory Addressing

3.2.3 Indirect Program Memory Addressing

3.3 Stack Memory-Addressing Modes

CHAPTER 4: INSTRUCTIONS (6hr)

4.1. Data Movement Instructions

4.1 MOV Revisited

4.2 PUSH/POP

4.3 Load-Effective Address

4.4 String Data Transfers

4.5 Miscellaneous Data Transfer Instructions

4.2: Arithmetic and Logic instructions

4.2.1 Arithmetic Instructions

4.2.2 Basic Logic Instructions

4.2.3 Shift and Rotate

4.2.4 String Comparisons

CHAPTER 5: PROGRAM CONTROL INSTRUCTIONS (4hr)

5.1 The Jump Group

5.1.1 Unconditional Jump (JMP)

5.1.2 Conditional Jumps and Conditional Sets

5.2 Controlling the Flow of the Program

5.2.1 LOOP

5.2.2 REPEAT

5.3 Procedures

5.3.1 CALL

5.3.2 RET

5.4 Introduction to Interrupts

5.4.1 Interrupt Vectors

5.4.2 Interrupt Instructions

5.4.3 Interrupt Control

5.5 Machine Control and Miscellaneous Instructions

5.5.1 Flag Control Instructions

5.5.2 WAIT

5.5.3 HLT

5.6. NOP

CHAPTER 6: 8086/8088 HARDWARE SPECIFICATIONS (5hr)

- 6.1 Pin-Outs and the Pin Functions
- 6.2 Clock Generator (8284A)
- 6.3 Bus Buffering and Latching
- 6.4 Bus Timing
- 6.5 Ready and the Wait State
- 6.6 Minimum Mode versus Maximum Mode

CHAPTER 7: INTERFACE (4hr)

- 7.1 Memory Interface
  - 7.1.1 Memory Devices
  - 7.1.1 Memory Pin Connections
- 7.2 I/O Interface
  - 7.2.1 Introduction to I/O Interface
  - 7.2.2 I/O Port Address Decoding
  - 7.2.3 The Programmable Peripheral Interface
  - 7.2.4 Analog-to-Digital (ADC) and Digital-to-Analog (DAC) Converters

CHAPTER 8: INTERRUPTS (4hr)

- 8.1 Basic Interrupt Processing
  - 8.1.1 The Purpose of Interrupts
  - 8.1.2 Interrupts
  - 8.1.3 Interrupt Instructions: INTO, INT, INT 3, and IRET
  - 8.1.4 The Operation of a Real Mode Interrupt
  - 8.1.5 Operation of a Protected Mode Interrupt
  - 8.1.6 Interrupt Flag Bits
  - 8.1.7 Storing an Interrupt Vector in the Vector Table
- 8.2 Hardware Interrupts

Laboratory outline

Week1	Lab Environment setup Assembly language instructions Registers Compiling and testing assembly codes
Week2	Simple Assignment and Arithmetic Operations Data storage and Variables Moving Data
Week3	Simple assignment and Arithmetic Operations Addition , Subtraction Register Reference Multiplication and Division
Week4	Control Statements Jumps, Labels and Flags
Week5	Conditional Statements Complex and Compound Conditional Expressions If then else conditional Expression
Week6	Looping Instructions
Week7	Arrays and Pointers
Week8	Addressing Data in CPU Simple Addressing Register (Immediate and Direct)
Week9	Subroutine and Stack Calling and Returning from Subroutine Pushing and Popping Stack
Week10	Recursion

Teaching- learning methods

Three contact hours of lectures and two hours of tutorials per week. Students do home assignments.

Assessment methods

Assignments/quizzes	10%
Mid semester examination	20%
Project	20%
Final examination	50%

Teaching materials

Text Books:

The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80486, Pentium and Pentium processor – Architecture, Programming and Interfacing by Barry B Brey. 4th Edition, prentice Hall – India – 2002

References:

- Ouglas v. Hall 'Microprocessors and Interfacing', Tata McGraw hill
- Uffenbeck 'Microcomputers and Interfacing', prentice hall
- Ram 'Fundamentals of Microprocessors and Microcomputers', Dhanpat Rai Ompkins 'PC interfacing', prentice hall
- Richard Trooper, Assembly Language Programming the IBM PC, McGraw Hill, 1994
- Vlad Pirogov, the Assembly Programming Master Book, 2006
- Peter Abel, IBM PC Assembly Language and Programming, 5h Edition, 2001.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Automata and Complexity Theory				**Course Code:** CoSc 3101	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	2
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course aims to develop the theoretical foundations of computer science through study of mathematical and abstract models of computers and the theory of formal languages. It also, introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, push down automaton, and Turing machine. The importance of time and space complexities, various notations and theorems of Complexity theory.

Course Objectives

By the end of this course, students will be able to:

- On completion of this course students should be able to:
- Introduce concepts in automata theory and theory of computation
- Study the central concepts of automata theory
- Acquire insights into the relationship among formal languages, formal grammars, and automata.
- Identify different formal language classes and their relationships
- Design grammars and recognizer for different formal languages
- Explain Models of Computation, resources (time and space), algorithms, computability, and complexity.

- Understand Complexity classes, P/NP/PSPACE, reductions, hardness, completeness, hierarchy, relationships between complexity classes.
- Learn Randomized computation and complexity; Logical characterizations, incompleteness and approximately.

Course Outline

Chapter **1**: Introduction (4hr)

1.1.1. Alphabets and strings

1.1.2. Languages and Grammars

1.1.3. Automata

1.1.3.1. Finite automata, Deterministic and Non-deterministic finite automata

Chapter 2: Regular Expression and Regular languages (4hr)

2.1. Regular expressions

2.2. Connection between regular expression and regular languages

2.3. Regular grammar

2.4. Pumping lemma and non-regular language grammars

Chapter 3: Context free languages (6hr)

3.1. Context free languages

3.2. Parsing and ambiguity

3.2. Sentential forms

3.3. Derivation tree or parse tree

3.3.1. Left most and right most derivations

3.4. Simplification of context free grammar

3.4.1. Methods for transforming grammars

3.4.2. Chomsky's hierarchy of grammars

Chapter 4. Push down automata (4hr)

4.1. Non-deterministic pushdown automata

4.2. Push down automata and context free languages

4.3. Deterministic push down automata

4.4. Deterministic context free languages

Chapter 5: Turing machines (4hr)

5.1. Standard TM

5.2. Construction of TM

5.3. Turing Decidable and Turing Acceptable

5.4. Undecidable problems

Chapter 6: Computability (4hr)

6.1. Recursive functions

6.2. Recursive languages and recursive Enumerable languages

Chapter 7: Computational complexity (6hr)

7.1. Big-O notaions

7.2. Class P vs class NP

7.3. Polynomial time reduction and NP-complete problems

7.4. Cook's Theorem

Teaching - Learning methods

Two contact hours of lectures, three hours of lab and two hours of tutorials per week. Students do home assignments.

Assessment method

Quizzes	20%
Assignments	30%
Test	10%
Final Exam	40%
Total	100%

Teaching materials

Required Texts:

Introduction to Automata Theory, Languages, and Computation by Hopcroft, Ullman and Motwani

Reference books:

- An Introduction to Formal Languages and Automata, Third Edition, Peter Linz, 2001
- An Introduction to Formal Language Theory that Integrates Experimentation and Proof Allen Stoughton, 2004.
- Complexity Theory: A Modern Approach Sanjeev Arora and Boaz Barak

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Data Structures and Algorithms				**Course Code:** CoSc 2092	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Computer Programming (CoSc 1012) & Discrete Mathematics and Combinatorics (MATH 2051)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course focuses on the study of data structures, algorithms and program efficiency. Topics include: analysis of time and space requirements of algorithms; program efficiency improving techniques, abstract data types such as linked lists, stacks, queues, trees (traversal, implementations); simple searching algorithms (linear search, binary search, ...), simple sorting algorithms (bubble sort, insertion sort, selection sort, ...), advanced sorting algorithms (merge sort, quick sort, heap sort ...)

Course Objectives

- To introduce the most common data structures like stack, queue, linked list
- To give alternate methods of data organization and representation
- To enable students use the concepts related to Data Structures and Algorithms to solve real world problems
- To practice Recursion, Sorting, and searching on the different data structures
- To implement the data structures with a chosen programming language

Course outline

Chapter 1. Introduction to Data Structures and Algorithms (4hr)

1.1. Introduction to Data Structures

1.1.1 Abstract data Types

1.1.2 Abstraction

1.2. Algorithms

1.2.1. Properties of an algorithm

1.2.2. Algorithm analysis concepts

1.2.3. Complexity analysis

1.3. Asymptotic Analysis

Chapter 2: Simple Sorting and Searching Algorithms (4hr)

2.1. Sorting Algorithms

2.1.1. Insertion sort

2.1.2. Selection Sort

2.1.3. Bubble sort

2.1.4. Pointer sort

2.2. Searching Algorithms

2.2.1. Linear Search (Sequential search)

2.2.2. Binary Search

Chapter 3: Linked Lists (4hr)

3.1. Review on Pointer and Dynamic Memory allocation

3.2. Singly Linked List and Its Implementation

3.3. Doubly Linked List and Its Implementation

3.4. Circular Linked Lists and Its Implementation

Chapter 4: Stacks (4hr)

4.1. Properties of Stack

4.2. Array Implementation of Stack

4.3. Linked List Implementation of Stack

4.4. Application of Stack

4.4.1. Evaluation of Algebraic Expression

4.4.2. Infix and Post fix (RPN) conversion

4.4.3. Function calls

Chapter 5: Queue (4hr)

5.1. Properties of Queue

5.2. Array Implementation of Queue

5.3. Linked List Implementation of Queue

5.4. Double Ended Queue (Deque)

5.5. Priority Queue

5.6. Application of Queues

Chapter 6: Trees (4hr)

6.1. Binary Tree and Binary Search Trees

6.2. Basic Tree Operations

6.3. Traversing in a Binary tree

6.4. General Trees and Their Implementations

Chapter 7: Graphs (4hr)

7.1. Introduction

7.2. Directed vs Undirected graph

7.3. Traversing Graph

Chapter 8: Advanced Sorting and Searching algorithms (4hr)

8.1. Advanced Sorting

8.1.1. Shell sort

8.1.2. Quick sort

8.1.3. Heap Sort

8.1.4. Merge sort

8.2. Advanced Searching

8.2.1. Hashing

Teaching - Learning methods

Two contact hours of lectures, three hours of lab and two hours of tutorials per week. Students do home assignments.

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%

Total 100%

Teaching materials

Reference books:

- Robert Lafore, "Data Structures and Algorithms in JAVA, 2nd Ed.", Sams Publishing
- Jean Paul Tremblay, Paul G. Soreson, "An Introduction to Data Structures with Applications", Mc. Graw Hill Computer Science Series
- E. Horowitz, S.Sahni and Dinesh Mehta. Fundamentals of data structures in C++, W.H Freeman and Company (1995)
- Sanjay Pahuja, A practical approach to data structures and algorithms, New age Internationapublishers, 2008

Data structures and Algorithms Laboratory Outline

Week1	**Introduction** Overview of C++, and programs to demonstrate C++ classes, structures and pointer
Week2	**Implementation of Array ADT and String AD**
Week3	**Implementing simple sorting algorithms** Selection sort, bubble sort, insertion sort
Week4	**Implementing searching algorithms** Linear search, binary search
Week5	**Implementing linked list** Singly linked list, doubly linked list, circular linked list
Week6	**Stack** Array Implementation of stack Linked List implementation of stack
Week7	**Queue** Array Implementation of queue Linked list implementation of queue
Week8	**Double ended queue (Deque) and Priority queue**
Week9	**Tree** Implementing Binary search tree
Week10	**Graph** Implementing graph traversal algorithms
Week11	**Advanced sorting algorithms** Shell sort, Heap sort
Week12	**Advanced sorting algorithms** quick sort, merge sort,
Week13	**Advanced searching algorithm** Hashing (open and closed hashing)

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Web Programming				**Course Code:** CoSc 3081	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	7	4	3	3	1
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

Client-server Architecture: Web page Design and development; information Architecture & visualization; static & dynamic pages, client side programming using scripting languages (JavaScript), OOP programming using PHP, File manipulation and Management using PHP. Multimedia web programming, dynamic web content creation; session tracking; Internet protocols, PHP Web controls, connecting web page to data base, loading and manipulating XML documents, web security; cryptography theory.

Objectives

The objective of this module is to familiarize students:

- The concepts, principles and methods in programming for web and Internet environment and the services and technologies available and used on Internet. Specifically, at the completion of this module the student is able to
- Provide fundamental concepts and skills for the understanding and development of web-based applications.
- Construct Web sites using HTML and Server-Side scripting Languages.
- Implement client-side interactivity
- Use CSS to manage Web site presentation and maintenance
- Select and customize existing technologies to set up and maintain web servers
- Specify, build and manage form and content of information-rich web sites

- Design, implement and evaluate client-server systems following specific protocol specifications, taking into account concurrency issue.

Course outline

Chapter 1: The world Wide Web (4hr)

1.1. Course overview

1.2. The Internet and World Wide Web

1.3. Web Hosting and Domain Name Registration

Chapter 2: Hyper Text Markup Language (HTML) (10hr)

2.1. Introduction to HTML

2.2. HTML tags

2.2.1. Basic HTML tags (HTML, HEAD, BODY,TITLE)

2.2.2. Meta tag

2.2.3. HTML Comments

2.2.4. HTML Link

2.2.4. HTML Text Formatting tags

2.2.5. HTML image inserting tag

2.2.5.1. IMG tag and its attribute

2.2.5.2. Inserting Image Map

2.2.6. HTML Table

2.2.7. Ordered and Unordered List in HTML

2.2.8. HTML Frames

2.2.8.1. Frame Set

2.2.8.2. Internal Frame

2.2.9. HTML Form and Form Controls

2.2.9. Inserting Multimedia in HTML

2.2.9.1. Embed vs Video and Audio tags

2.2.10. HTML Graphics

2.2.10.1. HTML Canvas

2.2.10.2. HTML SVG

Chapter 3: Cascading Style Sheet (CSS) (10hr)

3.1. CSS Basics

3.1.1. Introduction to CSS

3.1.2. CSS Syntax (CSS Selectors and Declarations)

3.1.3. Attaching CSS with HTML (External , Embedded and Inline)

3.2. Style Sheet Rules

3.2.1. Style Inheritance

3.2.2. Style Rules Precedence

3.3. Style Properties

3.3.1. Foreground and Background Properties

3.3.2. Font and Text Properties

3.3.3. CSS Box Model

3.3.4. Table Styling Properties

3.3.5. More On Styling List (Creating Navigation bars)

3.3.6. Layout and Positioning Properties

3.4. CSS Measuring Units

Chapter 4: Client Side Scripting (JavaScript) (8hr)

4.1. Introduction to JavaScript

4.2. JavaScript Basic

4.2.1. JavaScript Syntax

4.2.2. Attaching JavaScript to HTML (External, Embedded, Inline)

4.3. JavaScript Comments

4.4. Basic JavaScript Input Output

4.5. JavaScript Data Types and Variables

4.5.1. JavaScript Data types

4.5.2. Variable declaration in JavaScript

4.5.3. Data Type Conversion

4.6. Arithmetic and Logical Operators in JavaScript

4.7. Control Structures (Conditional and Looping Statements)

4.8. Array in JavaScript

4.9. JavaScript Functions

4.10. JavaScript DOM (Document object Model)

4.10.1. Accessing HTML elements in JavaScript

4.10.2. CSS in JavaScript

4.10.3. Events in JavaScript

Chapter 6: Advanced JavaScript and XML (AJAX) (4hr)

6.1. Introduction to AJAX

6.2. XMLHttpRequest Object

6.3. Sending Request to PHP server

6.4. Handling Response from Server

Chapter 7: Introduction to web development frameworks (4hr)

a. Bootstrap & jQuery
b. Node.js
c. Angular.js
d. React.js

Teaching - Learning methods

Three contact hours of lectures, three hours of lab and 1 hours of tutorials per week. Students do home assignments.

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%
Total	100%

Teaching materials

Reference books:

- Fundamental Concepts for Web Development: HTML5, CSS3, JavaScript and much more!, by Roxane Anquetil
- Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition by Jon Duckett (Author)
- W3Schools, https://www.w3schools.com

Web programming Laboratory outline

Week 1	Lab environment set up (installing text editor software, web browser, server software) Introduction to HTML Basic HTML tags and their attribute HTML, HEAD, TITLE, BODY HTML comment

	Meta tag Creating link Text formatting tags Headings, Paragraphs Font Text styling tags
Week 2	Image in HTML Inserting Image Using Image as a link Image map
Week 3	HTML Table Table row, Table header and Table data Attributes of table Attributes of table row and cell Using header, body and footer in HTML table HTML Lists Unordered list Ordered List
Week 4	Frames in HTML Frameset , Nested frame ,Internal frame HTML form Form attributes Input elements Inserting multimedia in HTML Inserting video Inserting audio
Week 5	CSS Linking CSS with HTML (embedded, inline and external CSS) Styling background, text, font, Styling Link, Table CSS class and ID
Week 6	CSS box model (margin, padding and boarder) CSS display, visibility, position and z-index
Week 7	JavaScript syntax Linking JavaScript with HTML (embedded, inline, external) The first code in JavaScript “Hello, World” JavaScript comments Basic Input output in JavaScript JavaScript variables Arithmetic and assignment operators in JavaScript Comparison and logical operators in JavaScript Data type conversion in JavaScript

Week 8	Conditional Statements If, if..else,if...elseif..else ad switch statement Looping statements For, while and do..while Break and continue statements
Week 9	Array in JavaScript Manipulating elements of an array Function in JavaScript
Week 10	JavaScript DOM Accessing Document elements CSS in JavaScript Event Handling JavaScript BOM (Window, Location, History, Cookies) Form processing and validation in JavaScript
Week11	PHP Syntax Output statements Comments PHP Variable and Data type conversion Control structures (Conditional and Looping statements)
Week12	Array Function Form Processing File uploading
Week13	Session and Cookie Database programming
Week14	File management in PHP Date and Time Math functions
Week15	Ajax programming
Week16	Introduction to Web development frameworks Bootstrap, node.js, angular.js

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Wireless Communication and Mobile Computing				**Course Code:** CoSc 3034	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Computer Network and Data communication (CoSc 2032)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course will examine the area of wireless networking and mobile computing, looking at the unique network protocol challenges and opportunities presented by wireless communications and host or router mobility. The course will give a brief overview of fundamental concepts in mobile wireless systems and mobile computing, it will then cover John. Wiley & Sons – Handbook of Wireless Networks and Mobile Computing.

system and standards issues including wireless LANs, Cellular Networks, mobile IP, ad-hoc networks, sensor networks, as well as issues associated with small hand held portable devices and new applications that can exploit mobility and location information.

Objectives

The objective of this module is:

- To provide an overview of Wireless Communication networks area and its applications in communication engineering.
- To appreciate the contribution of Wireless Communication networks to overall technological growth.
- To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks. To enable students to

compare and contrast multiple division techniques, mobile communication systems, and existing wireless network

- To provide an overview on Trends, issues and challenges on Mobile computing

Course Outline

Chapter 1: Introduction (4hr)

1.1. Introduction to Wireless communication and Mobile Computing

1.2. Types of Services

1.3. Wireless Vs Mobile

1.4. Applications

Chapter 2: Mobile Computing (4hr)

2.1. Fundamentals of Mobile computing

2.2. Mobile devices and Mobile OS

2.3. Mobile Computing Issues and Challenges

2.4. Mobile Computing Technologies

2.5. Mobile Computing Applications

Chapter 3: Wireless Network Principles (6hr)

3.1. Wireless Basics

3.2. Frequency Allocation and Regulation

3.3. Antennas

3.4. Signal Propagation

3.5. Multiplexing

3.6. Modulation

3.7. Media Access Control

3.8. Classifications of Wireless Networks

Chapter 4: Wireless Local Area Networks (WLANs) (4 hrs)

4.1. WLAN Overview

4.2. IEEE802.11 (WLAN) Standards

4.3. HiperLAN

4.4. WPAN Overview

4.5. IEEE 802.15 (WPAN) Standards

4.6. Wireless Sensor Networks and Zigbees

Chapter 5: Cellular Networks (6 hrs)

- 5.1. Principles of Cellular Networks
- 5.2. First Generation (1G) Cellular and Paging Networks
- 5.3. Second Generation (2G) Cellular Networks
- 5.4. The 2.5G Cellular Networks
- 5.5. Third Generation (3G) Cellular Networks
- 5.6. Fourth Generation (4G) Cellular Networks
- 5.7. Overview of Fifth Generation (5G) Cellular Networks

Chapter 6: Mobile Network Layer (4hr)

- 6.1. Mobile IP
  - 6.1.1. Introduction
  - 6.1.2. Mobile IP entities and Terminologies
  - 6.1.3. IP packet delivery
  - 6.1.4. Registration
  - 6.1.5. Tunneling and Encapsulation
- 6.2. Introduction to Mobile ad-hoc networks

Chapter 7: Wireless network security (4hr)

- 7.1. Introduction to wireless security
- 7.2. Examining wireless LAN vulnerabilities
- 7.3. Understanding WLAN security models
- 7.4. Securing wireless transmission using VPN
- 7.5. Wireless security policies

Teaching - Learning methods

Two contact hours of lectures, three hours of lab and 1 hours of tutorials per week. Students do home assignments.

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%
Total	100%

Teaching materials

Reference books:

- Vijay Garg, Wireless Communications and Networking.
- Amjad Umer, Mobile Computing and Wireless Communications.
- Jochen H. Schiller- Mobile communications ,2nd Edition
- Theodore.S. Rappaport, Wireless Communication and Principles and Practice, 2nd Edition.
- John. Wiley & Sons – Handbook of Wireless Networks and Mobile Computing.

Wireless communication and mobile computing laboratory outline

Week1	WLAN design
Week2	WLAN configuration
Week3	Simulating WLAN using GNS3, OPENet, ns2, ns3
Week4	Simulating Bluetooth
Week5	Simulating WIMAX
Week6-7	Designing and Simulating MANET, OPENet, OMNET++
Week8-9	Simulating Wireless Sensor Network
Week9	Simulating GSM and GPRS
Week9-10	Simulating 3G and LTE, NetSim
Week11-12	Simulating Mobile IP

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Design and Analysis of Algorithms				**Course Code:** CoSc 3094	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	Data Structure and Algorithms (CoSc 2092)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

The course focuses on the design and analysis of algorithms. Topics Include: Review of the basic data structures; Design techniques: divide-and-conquer, dynamic programming, greedy algorithms, And graph algorithms: Elementary graph algorithms, Breadth-first search (BFS), Depth-first search (DFS), Strongly-connected components, Minimum spanning tree, Shortest paths.

Objectives

By the end of this course, students will be able to:

- Perform algorithm analysis using the different techniques;
- Demonstrate the use of algorithm design techniques; and
- Describe the basics of computational complexity
- Apply advanced searching and sorting algorithms
- Develop, and reason about the correctness and performance of algorithms, in particular for string
- Searching and graph manipulation

Course Outline

Chapter 1: Introduction and Elementary Data Structures (6hr)

- 1.1. Introduction to Algorithm analysis
  - 1.1.1. Asymptotic Notations
  - 1.1.2. Analysis of Algorithm
- 1.2. Review of elementary Data Structures
  - 1.2.1. Heaps
  - 1.2.2. Hashing
  - 1.2.3. Set Representation
    - 1.2.3.1. UNION, FIND Operation

Chapter 2: Divide and Conquer (6hr)

- 2.1. The General Method of Divide and Conquer
- 2.2. Binary Search
- 2.3. Finding Maximum and Minimum
- 2.4. Merge Sort
- 2.5. Quick Sort
- 2.6. Selection Sort

Chapter 3: Greedy Algorithms (6hr)

- 3.1. General Characteristic of Greedy Algorithms
- 3.2. Graph Minimum Spanning Tree (MST) - Kruskal's and Prims's Algorithms
- 3.3. Shortest Paths
- 3.4. Scheduling

Chapter 4: Dynamic Programming (6hr)

- 4.1. Introduction to Dynamic Programming
- 4.2. All pairs Shortest Path - Floyd-Warshall Algorithm
- 4.3. Shortest Path - Dijkstra Algorithm
- 4.4. 0/1 Knapsack
- 4.5. Depth First Search

Chapter 5: Back Tracking (6hr)

- 5.1. 8 Queens Problem
- 5.2. Graph Coloring
- 5.3. Hamiltonian Cycle

5.4. Knapsack Problems

5.5. Traveling Salesman Problems

Chapter 6: Introduction to Probabilistic Algorithms - Parallel Algorithms (2hr)

Teaching - Learning methods

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%
Total	100%

Teaching materials

Reference books:

- Cormen, T.H. et al. (1990) Introduction to Algorithms. MIT Press and McGraw-Hill
- Book Company.
- Manna, Z. (1974) Mathematical Theory of Computation McGraw-Hill.
- Baase, S. (1988) Computer Algorithms: Introduction to Design and Analysis, 2nd ed.
- Addison-Wesley Publishing Company.
- T. H. Cormen, C. E. Leiserson, R. L. Rivest. Introduction to Algorithms The MIT Press, Cambridge, Massachusetts, 3rd edition.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Compiler Design				**Course Code:** CoSc 4103	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Automata and Complexity Theory (CoSc 3101)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

The course builds on the student's core knowledge of languages, grammars and programming and provides an opportunity to see how these core areas can come together to form an application area. It also imparts the knowledge about the following

To learn basic techniques used in compiler construction such as lexical analysis, top-down and bottom-up parsing, context-sensitive analysis, and intermediate code generation.

To learn basic data structures used in compiler construction such as abstract syntax trees, symbol tables, three-address code, and stack machines.

To learn software tools used in compiler construction such as lexical analyzer generators, and parser generators.

Course Objectives

By the end of this course, students will be able to:

- Implementing a small compiler using modern compiler writing tools.
- Providing the student with skills and knowledge (such as lexical analysis and parsing) which are applicable to a broad range of computer science application areas (such as text editors, information retrieval, etc...).

Course Outline

Chapter 1: Introduction (2hr)

- 1.1. Phases of a Compiler
- 1.2. Computer Language Representation
- 1.3. Compiler Construction Tools

Chapter 2: Lexical Analysis (4hr)

- 2.1. Token Specification
- 2.2. Recognition of Tokens
- 2.3. Recognition of Machines
- 2.4. NFA to DFA Conversion
- 2.5. Error Recovery
- 2.6. A typical Lexical Analyzer Generator
- 2.7. DFA Analysis

Chapter 3: Syntax Analysis (6hr)

- 3.1. Parsing
- 3.2. Top-down Parsing
  - 3.3.1. Predictive Parsing
  - 3.4.1. Top-down Parsing principles of CFG
  - 3.5. Regular Expression Vs Context Free Grammar (CFG)
  - 3.6. Top-down Parsing Implementation - Recursive Decent parsing
  - 3.7. Non-Recursive Predictive Parsing
  - 3.8. LL(1) Grammar
- 3.9. Bottom-Up Parsing
  - 3.10. Handles
  - 3.11. Stack Implementation of Shift Reduce Parsing
  - 3.12. LR Parers-Implementation - LR Parsing Algorithms
  - 3.13. SLR, CLR and LALR parser
- 3.3. Error Recovery
- 3.4. Parser Generator

Chapter 4: Syntax Directed Translation (4hr)

- 4.1. Syntax Directed Definitions (SDD)
- 4.2. Evaluation Order for SDD

4.3. Construction of Syntax Trees

Chapter 5: Type Checking (4hr)

5.1. Rules of Type Checking

5.2. Type Conversions

Chapter 6: Intermediate Languages (4hr)

6.1. Three Address Code Rules

6.2. Quadruples

6.3. Declarations

6.4. Declarations in Procedures

6.5. Flow Control Statements

6.6. Back Patching

6.7. Procedure Calls

Chapter 7: Run time- Environments (4hr)

7.1. Symbol table

7.2. Hash Table

7.3. Representing Scope Information

Chapter 8: Code Generation and Optimization (4hr)

8.1. Simple Code Generation

8.2. Register Allocation

8.3. DAG Representation

8.4. Peephole Optimization Techniques

Teaching - Learning methods

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%
Total	100%

Teaching materials

Text Books:

- T1: Alfred Aho, Ravi Sethi, V.Jeffery Ullman D. "COMPILERS PRINCIPLES, TECHINQUES AND TOOLS ", Addison- Wesley, 1988.

Reference Books:

- Allen Holub l. "Compiler Design in C", Prentice Hall of India. 1990.
- Charles N.Fischer Richard J.Leblanc, "Crafting a compiler with C", Benjamin Cummings, 1991

Compiler design laboratory manual

Week1	Introduction and lab environment setup Lex and Yacc tools
Week2	Simulating Lexical analyzer for validating Operators and expressions
Week3	Implementing lexical analyzer using JLex, flex or other lexical analyzer generator tools
Week4	Implementing functionality of predictive parser for mini language
Week5	Constructing LL((1) parser
Week6	Constructing recursive descent parsing
Week7	Implementing LALR parsing
Week8	Convert BNF rules into YACC form Generating abstract syntax tree for mini language
Week9	Generate machine code from abstract syntax tree generated by parser

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: *Computer Science*					
Course Title: Computer Graphics				**Course Code:** CoSc 3072	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Fundamental of Programming in C++ (CoSc 2015)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience using a graphics application programming interface (OpenGL) by completing several programming projects.

Course Objectives

By the end of this course, students will be able to:

- Have a basic understanding of the core concepts of computer graphics.
- Be capable of using OpenGL to create interactive computer graphics.
- Understand a typical graphics pipeline.
- Have made pictures with their computer.

Course Outline

Chapter 1: Introduction to Interactive Computer Graphics (4hr)

1.1. Brief History of Computer Graphics

1.2. 3D Graphics Techniques and Terminology

1.3. Common Uses of Computer Graphics

1.4. Application Area

Chapter 2: Graphics Hardware (2hr)

2.1. Raster Display Systems

2.2. Introduction To The 3D Graphics Pipeline

2.3. The Z Buffer For Hidden Surface Removal

Chapter 3: Introduction to The Rendering Process with OpenGL (3hr)

3.1. The Role of OpenGL in the Reference Model

3.2. Coordinate Systems

3.3. Viewing Using a Synthetic Camera

3.4. Output Primitives and Attributes

Chapter 4: Geometry and Line Generation (5hr)

4.1. Point and Lines, Bresenham's Algorithm Generating Circles

4.2. Plotting General Curves

4.3. Line Thickness

4.4. Line Style

4.5. Polygons

4.6. Filling

4.7. Text and Characters

Chapter 5: Geometrical Transformations (3hr)

5.1. 3D Transformation

5.2. Matrix Representation

5.3. Homogeneous Coordinates

5.4. Combination of Transformations

Chapter 6: State Management and Drawing Geometric Objects (3hr)

6.1. Basic State management

6.2. Displaying Points Lines and Polygons3

6.3. Normal Vector

6.4. Vector Arrays

Chapter 7: Representing 3D Objects (2hr)

7.1. Modeling Using Polygons

7.2. Techniques for Creating Representational Polygon Meshes

7.3. Non-Polygonal representations

Chapter 8: Color and Images (2hr)

8.1. Color in Computer Graphics TGB, CIE

8.2. Image Formats and Their Applications: GIF, JPG, PNG

Chapter 9: Viewing A local Illumination Model (4hr)

9.1. Using The Camera Model for Viewing 3D Scenes

9.2. Perspective and Other Types of Projection

9.3. Viewing Types of Light Source

9.4. Reflectance Models: Diffuse (Lambert) and Specular (Phong) Gouraud and Phong Interpolation

9.5. Lightning and Shading in OpenGL Textures

Chapter 10: Application Modeling (4hr)

10.1. Distinction Between Modeling and Graphics

10.2. Immediate Mode Versus Retained Mode Model

10.3. Storage Strategies

10.4. The Matrix Stacks

10.5. OpenGL Display Lists: Traversal and Instancing

10.6. How The Concepts are Realized in Specific Systems: OpenGL and java3D

Teaching - Learning methods

Assessment method

Quizzes	20%
Assignments	10%
Project	20%
Final Exam	50%
Total	100%

Teaching materials

Text Books:

- Richard S. Wright et.al. OpenGL® SuperBible: Comprehensive Tutorial and Reference, Fifth Edition Addison-Wesley Professional
- Glen W Rowe, Computer Graphics with Java, PALGRAVE, 2001

Computer Graphics Laboratory Outline

Week1	Introduction to OpenGL Rendering pipeline Libraries Include files Setting up compiler Compiling OpenGL/GLUT programs
Week2	Implementation for drawing 2D primitives Points, lines, Circle, polygon
Week3	2D transformation Translation Rotation Reflection Window viewport
Week4	Composite 2D transformation
Week5	Line Clipping
Week7	3D transformation Translation Rotation Scaling
Week8	3D projection Parallel Perspective
Week9	Image editing and Manipulation
Week10	2D animation

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Industrial Practice				**Course Code:** CoSc3122	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	3	2	0	0	0
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course description

Industrial Practice is an organization-based practical training experience that prepares students for the tasks they are expected to perform after graduation (completion of their university education).

Course objectives

The objective of Industrial Practice is to produce practically oriented graduates that meet the required job-related competences of their future employers. Through practical attachment, potential employees are enabled to voice their ideas about the competencies, skills and knowledge of new graduates. The specific objectives include:

- To enable students get hands-on experience real-life situation they are expected to work in when they graduate.
- To provide an opportunity for students to apply the principles and techniques theoretically learnt into real-life problem solving situations.
- To provide an opportunity for students to interact with the stakeholders and potential employers to appreciate the different office situations
- To develop student understanding of work ethics, employment demands, responsibilities and opportunities.
- To enhance and strengthen linkages between University and various stakeholders.
- To provide workplace experience/exposure for students

- To enhance the department's network and linkages with industrial companies & businesses vis-à-vis career placement for its graduates
- To provide opportunities for future professionals relative to the labor market
- To enable the students to apply and appreciate the relevance of classroom learning

Roles and responsibilities of stakeholders

Industrial Practice will be implemented through partnership between the university and other partners. This partnership has three key stake holders namely: the university partners, the university and the students.

For the Industrial Practice program to be effective and sustainable, the three partners have to commit themselves to specific roles and responsibilities. The following are the roles and responsibilities of each partner:

I. The University

- Will provide overall institutional management of the program.
- Will be responsible for the development of a monitoring and evaluation criteria for practical attachment program including code of conduct for the students.
- Will be responsible for identifying organizations that offer valuable learning experiences to the students.
- Shall initiate partnership with relevant organizations and concretize this partnership with memorandum of understanding.
- Shall build practical attachment expenses in the university fees structure and budget.
- Will create platforms and mechanisms for sharing experience arising out the practical attachment program by the stakeholders.

II. University Partners

- Shall assign the student(s) in a section relevant to their profession and assign supervisor.
- Shall participate in the planning, supervision and evaluation of the students on practical attachment.
- Will provide technical and professional guidance to the students on practical attachment throughout the practical attachment period.

- Will provide feedback to the university on the experience of the practical attachment program.
- Will commit their organizational facilities and/or resources for effective implementation of the practical attachment program.
- Will provide students on practical attachment with a wide range of experiences that go beyond technical skills.
- Shall give accreditation and credit gains to students on practical attachment.
- Shall complete the performance assessment form of the student.

III. The Students

- Shall take the practical attachment as part and parcel of their training at their University and have positive attitude towards learning by practice.
- Shall attend the work of the organization like any regular employee and perform all activities of the organization given to him/her.
- Shall respect all attachment supervisors and any other persons they interact with throughout their practical attachment period regardless of their background training and social differentiation,
- Should work willingly wherever they are posted/attached.
- Should develop the day-to-day work plans with their attachment supervisors.
- Must adhere to the practical attachment code of conduct and code of conduct of the host organization.
- Should be aware that all university policies and procedures apply throughout the duration of the practical attachment work.
- Shall produce a written report of the attachment experiences after the completion based on contents given in Appendix I.

Structure of the attachment

The practical attachment is organized through three steps namely, placement, supervision and evaluation.

a. Placement

Students will be placed in organizations selected by themselves or in places which will be identified by the university. Students will go for Industrial Practice during the summer time i.e.,

on July and August. The students are expected to undergo Industrial Practice for not less than **(300) hrs** but not **more than 2 months** to the selected and recommended organization/industry.

b. Supervision

Each student is expected to have one supervisor from the organization and one from the department. The **practical attachment supervisor** from the organization monitors the day-to-day performance of the student. While the **academic supervisor** from the department will visit the organization at least two times without informing the students for checking whether or not the students are really working. During the visit, the academic supervisor will interact with the student, his/her supervisor, and other relevant officials to acquaint himself/herself with the activities of the student.

The attachment and academic supervisors need to meet the following requirements.

i. Practical attachment supervisors

Attachment supervisors in the organizations shall:

- Be persons with relevant practical experience.
- Show willingness to have regular contact with the student on practical attachment.
- Have reasonable ethical and professional conduct.
- Be willing to engage in a learning experience with the student on practical attachment.
- Will evaluate the students' work performance on the attachment.

ii. Academic supervisors (from the department)

- Should be qualified academic staffs, i.e., lecturer and above.
- Willing to communicate to the partners and/or attachment supervisors in advance.
- Willing to evaluate the students' report and presentation of the attachment.

c. Evaluation

The assessment will be distributed between the attachment supervisor, academic supervisor and practical attachment report.

Evaluation by Attachment Supervisor

When the student completes the attachment period, the supervisor shall fill the evaluation form, developed by the department, attached herewith and send it to the university in a

sealed and stamped envelope. This assessment by the practical attachment supervisor will account for 40%.

Evaluation by Academic Supervisor

The staff members of the department will evaluate the students by visiting the host organizations and reading their attachment report. This assessment by the academic supervisor based on criteria determined by the department will be out of 30%.

Evaluation by Examination Committee

After the attachment report of each student is evaluated by the respective academic supervisor, the student is expected to correct it based on the comments given. Then, the student will present the report to the examination committee of the department in the presence of his/her classmates and other individuals. For this evaluation, the department will arrange a committee of three staffs for each student presentation. The academic supervisor will chair the presentation and see the consistency of the written report and the presentation. This assessment by the examination committee will account for 30%.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Network and System Administration				**Course Code:** CoSc4036	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Data Communication and Computer Networks (CoSc2032) & Operating system (CoSc3023)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course deals with the concepts and techniques of systems and network administration. This course instructs students how to administer and manage a modern network by properly planning and implementing various functions of a Network OS. Key components include how to plan server deployment, server monitoring and maintenance, application and data provisioning, and providing business continuity and availability by proper use of security configuration and backup policies. The course material is designed to provide extensive hands-on experience. Topics include: installation and configuration; the boot process; user and group administration; file system administration, including quotas, FACLs, RAID and LVM; task automation; client networking; software management; log files; troubleshooting; Emphasis is also given on storage, file management system, connectivity, security, troubleshooting, archiving, backing up, directory services, remote administration, access control lists.

Course objectives

By the end of this course, students will be able to:

- Understand the concepts, principles, and roles of system and network administration.
- Understand how to install/configure Linux operating system
- Understand how to build network services to users

- Understand how to design/implement small to medium level network administration
- Understand how to identify security policies and troubleshooting
- Understand how to apply scripting for system administration

Course outline

Chapter 1: Introduction to System & Network Administration (3 hrs)

1.1 Objectives/Goals, Challenges and Common Practices

1.2 Overview of the OSs

1.3 Unix-like Systems Vs Windows Systems

1.4 Linux Distributions and UIs

1.5 Linux Operations Review

1.5.1 File system Hierarchy and Standard

1.5.1.1 Single-rooted hierarchy, Seamless and Extensible File systems

1.5.1.2 Mounting Additional File systems

1.5.1.3 File system Object Oriented Design and File system Standard

1.5.1.4 Unix File and Directory Permissions

1.5.2 Essential Shell Commands

1.5.2.1 Basic File Manipulation Commands and Directory Navigation Commands

1.5.2.2 Advanced File Manipulation Commands (Init, Processes, and Threads)

1.5.3 Advanced Shell Features

Chapter 2: Account and Security Administration, and Access Control (DAC, RBAC) (3 hrs)

2.1 Account and security Administration

2.1.1 User and Group Concepts, and User Private Group Scheme

2.1.2 User Administration, Modifying Accounts and Group Administration

2.1.3 Password Aging and Default User Files

2.2 Managing files and folder permission

2.2.1 Managing File Ownership

2.2.2 Controlling Access to files

2.2.3 Managing Disk Quotas

Chapter 3: File Systems and Management of Data Storages (4hr)

3.1 File system Administration

3.1.1 Partitioning Disks with fdisk and parted

3.1.2 Creating, Mounting and Maintaining File systems

3.1.3 Swap

3.1.4 Determining Disk Usage With df and du

3.1.5 Configuring Disk Quotas

3.2 Logical Volume Management (LVM) and RAID

3.2.1 Implementing LVM, Creating Logical Volumes (LVs), Manipulating VGs & LVs

3.2.2 Advanced LVM Concepts (i.e. system-config-lvm)

3.2.3 RAID Concepts (Creating and Managing a RAID-5 Array)

Chapter 4: Network Management (6 hrs)

4.1 TCP/IP Networking

4.2 Configuring a Linux Box for Networking

4.3 Configuring a Linux Box as a Router

4.4 Configuring a Web Server (Apache)

4.5 Configuring a DNS Server (BIND)

4.6 Configuring Mail Transfer Agents (Postfix)

4.7 Configuring a Proxy Caches (Squid)

4.8 Network Configuration (IP Networking and Linux Network Configuration)

4.9 Network Services

4.9.1 Dynamic Host Control Protocol (DHCP)

4.9.2 Network Time Services and Sharing Desktops with VNC

4.9.3 RPC-Based Services and INET Super Server

4.10 TCP/IP Troubleshooting: ping, traceroute, ifconfig, netstat, ipconfig

4.11 Remote Administration with SSH and SCP

4.11.1 Configuration, Telnet Replacement, Secure Copy and Rsync

4.11.2 RSA and DSA Authentication (Password-less Logins)

4.11.3 Remote Command Execution and Port Forwarding

Chapter 5: Installation of Application Server and Management (6 hrs)

5.1 DHCP, DNS, Telnet server; compare with other NOS setup of corresponding network services

5.2 Open SSH: Secure Network Communication

5.3 FTP and Setting-up Mail Servers and Client

5.4 Network Information Service (NIS) and Sharing File systems (NFS)

5.5 SAMBA: Linux and Windows File and Printer Sharing

5.6 DNS/BIND: Tracking Domain Names and Address

5.7 Setting up a Firewall and a Web server

Chapter 6: Managing Network Services (4 hrs)

6.1 Maintenance Troubleshooting: Common System and Network Problems

6.2 Developing General Strategies

6.3 Resolve Boot Problems, Backup and Restore Data and System Volume

6.4 Using Event Viewer and Troubleshoot Connectivity

Chapter 7: Systems Security (4 hrs)

7.1 Overview, Application Security and Login Security

7.2 Boot Loader Security (LILO and GRUB)

7.3 TCP Wrappers Configuration

7.4 Iptables Firewalling: Preliminaries

7.5 Iptables Scenarios

7.5.1 Packet Filtering

7.5.2 Port-Forwarding/Redirection and NAT/IP Masquerading

7.6 Packet-Processing Model

7.7 Intrusion Detection and Mandatory Access Control (MAC) with LIDS

Chapter 8 - Analytical system administration (2 hrs)

8.1 System observation

8.2 Evaluation methods and problems

8.3 Evaluating a hieratical system

8.4 Faults

8.5 Deterministic and stochastic Behaviors

Lab Contents:

Window server

Part 1: Server Installation and Configuration

- Introducing Windows Server 2016
- Installing Windows Server 2016
- Configuring Windows Server 2016 Basic Settings
- Configuring Server roles and services
- Managing hard drives and volumes

Part 2: Network Users, Resources, and Special Server Roles

- Understanding and configuring Active Directory Domain services
- Creating Active Directory groups, Organizational Units, and Sites
- Adding client computers and member servers to the domain
- Deploying group policy and network access
- Working with network shares and the distributed file system

Part 3: Account and Security Administration, and Access Control

- Account and security Administration
- Managing files and folder permission

Part 4: Systems Security

- TCP Wrappers Configuration
- Iptables Firewalling: Preliminaries

Part 5: Analytical system administration

- System observation
- Evaluation methods and problems

Part 6: Linux Server configuration

- Ubuntu or Debian latest version installation
- Revising Linux fundamental
- Automating tasks using scripting language
- DNS Master and Slave servers
- Updating Microsoft DNS server
- Configuring and run servicer software like
    - Monitoring (with Icinga and Collectd)
    - Backup and restore (with Bacula)
    - File serving (with Samba)
    - Virtualisation (with ProxMox)
    - Email (with Postfix and Dovecot or Courier)

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

- Principles of Network and System Administration, (2nod Edition), John Wiley and Sons Ltd, Mark Burgess, 2004.

References:

1. The Practice of System and Network Administration: by Thomas A. Limoncelli Christina J. Hogan , Strata R. Chalup, (3rd Edition)
2. TCP/IP Network Administration" (3rd Edition), O'Reilly and Associates Inc., Craig Hunt, 2002.
3. Running Linux, (5th Edition), O'Reilly and Associates Inc., Matthias Kalle Dalheimer and Matt Welsh, 2007.
4. Essential System Administration (ESA), Aeleen Frisch, 3rd edition, O'Reilly.
5. Unix and Linux System Administration Handbook" fourth edition by Nemeth et
6. Linux Fundamentals", Paul Cobbaut, downloadable from http://linux-training.be.
7. Introducing Windows Server 2016 handbook published by Microsoft Press A division of microsoft Corporation One Microsoft Way Redmond, Washington 98052-6399

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Introduction to Artificial Intelligence				**Course Code:** CoSc3112	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Data Structures and Algorithms (CoSc2092) & Probability and Statistics (STAT2015)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

The purpose of this course is to give students an understanding of Artificial Intelligence methodologies, techniques, tools and results. Students will use python programming language to demonstrate laboratory exercises. Students will learn the theoretical and conceptual components of this discipline and firm up their understanding by using AI and Expert System tools in laboratory sessions, projects and home assignments.

Course objectives

At the end of this course the students will be able to:

- Understand reasoning, knowledge representation and learning techniques of artificial intelligence
- Evaluate the strengths and weaknesses of these techniques and their applicability to different tasks
- assess the role of AI in gaining insight into intelligence and perception
- know classical examples of artificial intelligence
- know characteristics of programs that can be considered "intelligent"
- understand the use of heuristics in search problems and games
- know a variety of ways to represent and retrieve knowledge and information

- ❖ know the fundamentals of artificial intelligence programming techniques in a modern programming language
- ❖ consider ideas and issues associated with social technical, and ethical uses of machines that involve artificial intelligence
- ❖ Introduce students for powerful learning algorithms and their applications.
- ❖ Letting students to develop simple AI powered applications either in robotics, NLP or games.

Course Outline

Chapter 1: Introduction to AI (3 hrs)

1.1 Objectives/Goals of AI

1.2 Types of AI(General and Specific AI)

1.3 Approaches to AI – making computer:

1.3.1 Think like a human (Thinking humanly)

1.3.2 Act like a human (Acting humanly)

1.3.3 Think rationally (Thinking rationally)

1.3.4 Act rationally (Acting rationally)

1.4 The Foundations of AI

1.5 Bits of History and the State of the Art

1.6 Proposing and evaluating Application of AI

Chapter 2: Intelligent Agents (4 hrs)

2.1 Foundation of Agents

2.2 Agents and Environments

2.3 Acting of Intelligent Agents (Rationality)

2.4 Structure of Intelligent Agents

2.4.1 Agent Types

2.4.2 Simple reflex agent

2.4.3 Model-based reflex agent

2.4.4 Goal-based agent

2.4.5 Utility-based agent

2.5 Multi agent systems

2.6 Learning agent

Chapter 3: Searching and Planning (6 hrs)

3.1 Solving Problems by Searching and planning

3.2 Constraint Satisfaction Problem

3.3 Problem Solving Agents

3.4 Problem spaces and search

3.5 Knowledge and rationality

3.6 Heuristic search strategies

3.7 Search and optimization (gradient descent)

3.8 Adversarial search

3.9 Planning and scheduling

3.10 Avoiding Repeated States

3.11 Dynamic game theory

Chapter 4: Knowledge Representation and Reasoning (8 hrs)

4.1 Logic and Inference

4.2 Logical Agents

4.3 Propositional Logic

4.4 Predicate (First-Order)Logic

4.5 Inference in First-Order Logic

4.6 Knowledge Representation

4.7 Knowledge Reasoning

4.8 Bayesian reasoning

4.9 Probabilistic reasoning

4.10 Temporal reasoning

4.11 Knowledge-based Systems

4.12 Case study: Medical diagnosis

Chapter 5: Machine Learning Basics (3 hrs)

5.1 Knowledge in Learning

5.2 Learning Probabilistic Models

5.3 Supervised learning

5.3.1 Linear classification models

5.3.2 Probabilistic models

5.4 Unsupervised learning

5.4.1 Clustering models

5.5 Reinforcement learning

5.6 Deep Learning

5.6.1 Neural networks and back-propagation

5.6.2 Convolution neural networks

5.6.3 Recurrent neural networks and LSTMs

Chapter 6: Natural Language Processing (NLP) Basics (3 hrs)

6.1 Intro to Natural Language Processing

6.2 Machine learning Application in NLP

6.3 Natural language interaction

6.4 Computer vision and Image processing

6.5 Case study: Sentiment Analysis, speech recognition, Chabot

Chapter 7: Robotic Sensing and Manipulation (3 hrs)

7.1 Introduction to robotics

7.1.1 Sensing

7.1.2 Manipulation

7.1.3 Human-robot interaction

7.2 Navigation and path planning

7.2.1 Autonomous robotic systems

Chapter 8: Ethical and Legal Considerations in AI (2 hrs)

8.1 Privacy

8.2 Bias

8.3 AI and the future of work

8.4 Appropriate uses of AI

Lab contents: With python or prolog

Lab 1: Tool installation and configuration, introduction to the tool

Lab 2: Implementing search strategies

Lab 3: Knowledge representation

Lab 4: Knowledge Reasoning

Lab 5: Implementing knowledge base system

Lab 6: Implementing neural network

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

Russell, S. and P. Norvig (1995) Artificial Intelligence: A Modern Approach Prentice-Hall

References:

1. Luger, G. (2002) Artificial Intelligence, 4th ed. Addison-Wesley.
2. Bratko, Ivan (1990) PROLOG Programming for Artificial Intelligence, 2nd ed. Addison-Wesley, 1990
3. Winston, P.H. (1992) Artificial Intelligence Addison-Wesley. Ginsberg, M.L. (1993) Essentials of Artificial Intelligence. Morgan Kaufman.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Computer Vision and Image Processing				**Course Code:** CoSc4113	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Computer Graphics (CoSc 3072) & Probability and Statistics (STAT2015)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This is an introductory course in processing grey-scale and color images. It will introduce students to the basic principles of processing digital signals and how those principles apply to images. These fundamentals will include sampling theory, transforms in appearance and geometry, filtering and object segmentation. The course will also cover a series of basic image processing problems including enhancement, reconstruction, segmentation, feature detection, and compression.

Course objectives

At the end of this course, students are expected to:

- Define fundamental concepts of computer vision and image processing system
- Apply pre-processing operations in image enhancement
- Analyze 2-dimensional signals in the frequency domain through the Fourier transform
- Describe the basic concepts of color image processing
- Apply image restoration, reconstruction and compression operations
- Design and implement image processing algorithm with Python.

Course outline

Chapter 1. Introduction to computer vision and image processing (4 hrs)

1.1 What is a computer vision?

1.2 What is image?

1.3 Related fields in CV

1.4 Computer Vision Vs image processing

1.5 Application of CV and IP

1.6 Different Image processing examples

1.7 Fundamental steps in image processing

Chapter 2: Digital image fundamentals (4 hrs)

2.1 Basic concept of image

2.2 Digital image Representation

2.3 Digital image acquisition process

2.4 Image sampling and quantization

2.5 Representation of different image type's

2.6 Mathematical Tools used in Digital Image Processing

Chapter 3: Spatial Domain Image Processing (4 hrs)

3.1 Spatial Processing of Digital Images

3.2 Basic Intensity Transformation Functions

3.3 Histogram of images

3.4 Spatial filtering

3.5 Histogram processing

3.6 Combining Spatial Enhancement Methods

Chapter 4: Frequency Domain Image Processing (4 hrs)

4.1 Introduction to frequency domain

4.2 Frequency spectra

4.3 Fourier series

4.4 Continuous One-Dimensional Fourier Transform and Its Inverse

4.5 Discrete One-Dimensional Fourier Transform and Its Inverse

4.6 Frequency information of images

4.7 Image enhancement in frequency domain

Chapter 5: Image Restoration and Reconstruction (4 hrs)

5.1 Introduction

5.2 Models of images and noise

5.3 Estimation of noise parameters

5.4 Restoration in the presence of noise

Chapter 6: Image Compression (4 hrs)

6.1 Basic definition of image compression

6.2 Data redundancy

6.3 Elements of information theory

6.4 General mechanism and types of data compression and image restoration

6.5 Huffman coding

6.6 Arithmetic coding

6.7 Dictionary based coding

6.8 Bit-plane coding

Chapter 7: Color Image Processing (4 hrs)

7.1 Color Fundamentals

7.2 Color Models (color space or color system)

7.3 Basics of Full-Color Image Processing

7.4 Morphological image processing

7.5 Color Transformations

Chapter 8: Object Recognition (4 hrs)

8.1Fourier descriptors

8.2 Machine learning and deep learning for object recognition

8.3 Three-dimensional image analysis using deep learning

Lab contents: Use Python or Matlab

Lab 1: Digital image representation

Lab 2: Image enhancement in the spatial domain

Lab 3: Image restoration and reconstruction

Lab 4: Image compression

Lab 5: Color image processing

Lab 6: Morphological image processing

Lab 7: Image segmentation

Lab 8: Image filtering

Lab 9: Edge Detection

Lab 10: Object Recognition

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

1. R.J. Schalkoff, Wiley, Digital Image Processing and Computer Vision
2. R.C.Gonzalez & P.Wintz, Digital Image Processing - 2004
3. William K. Pratt, Digital Image Processing, 3rd edition, 2001

References:

1. Computer Vision - D.H.Ballard & C.M.Brown
2. Fundamentals of Digital Image Processing - A.K. Jain
3. Digital Picture Processing - A. Rosenfeld and A.C. Kak
4. Pattern Classification and Scene Analysis - R.O. Duda and P.E. Hart
5. Object Recognition by Computer - W.E.L. Grimson
6. Syntactic Pattern Recognition : An introduction -R.C.Gonzalez and M.G.Thomason
7. Pattern Recognition - A Statistical Approach - P.A. Devijver and J. Kittler

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Research Methods in Computer Science				**Course Code:** CoSc4123	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	3	2	2	0	0
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

The course focuses on the study of current methods and techniques in computer science research. The major topics includes research in computing, proposal preparation, using resources to conduct research, writing research papers and making presentations, ethical issues. The instructional methods and techniques include traditional lectures with some assignments, student presentations and group problem solving.

Course objectives

Upon completion of the course, the students will be able to:

- Describe computing research methods
- Develop effective research proposal
- Conduct research effectively in computer related fields
- Appropriately use resources to conduct research
- Organize and prepare technical papers, thesis and presentations
- Work and cooperate effectively with other research workers on a computing research
- Aware of the research ethics and other related issues

Course outline

Chapter 1: Introduction and Overview of Research (5 hrs)

- 1.1. What is Research and not Research?
- 1.2. Scientific Research
- 1.3. Objectives, Motivations and Significance of Research
- 1.4. Requirements and Characteristics of Research
- 1.5. Types and Approaches of Research
- 1.6. Research Methods and Problem Solving
- 1.7. Effective Report Writing Principles and Criteria for Good Research
- 1.8. Evaluating and Reviewing Research Results
- 1.9. What is Research in Computing?

Chapter 2: Processes in Conducting Research (6 hrs)

- 2.1. Overview of Current State of the Art Areas and Techniques in Computing
- 2.2. Actors, Roles and Relationship
  - 2.2.1. The Student
  - 2.2.2. The Supervisor
  - 2.2.3. The Examiner/Evaluator
- 2.3. The Process
  - 2.3.1. Developing Research Proposal
  - 2.3.2. Developing Problem Description
  - 2.3.3. Following the Objectives
  - 2.3.4. Presenting and Analyzing the Data
  - 2.3.5. Drawing Conclusion and Identifying Future Work
  - 2.3.6. Presenting and Defending Orally
  - 2.3.7. Preparing Final Research Documentation (Thesis)
- 2.4. Proposal Preparation
  - 2.4.1. Choosing a Subject Area
  - 2.4.2. Choosing a Problem within the Subject Area
  - 2.4.3. Quality Assurance of Initial Ideas
  - 2.4.4. Write Research Proposal
  - 2.4.5. Sample and More Acceptable Research Proposal Structure
  - 2.4.6. Research Proposal Check-list

2.5. Literature Reviews

2.5.1. Importance and Roles of Literature Review

2.5.2. Skills and Keys to Effective Literature Review

2.5.3. Literature Sources (Journals, Conference Proceedings, Books, Reports, Thesis, etc)

2.5.4. Literature Review Writing

2.6. Assessment Criteria

Chapter 3: Resources to Conduct Research (5 hrs)

3.1. Digital Libraries (IEEE, ACM, Science Direct, Springer, etc.)

3.2. Documentation Tools (Ex: Latex) and Language Skill

3.3. Team Work

3.4. Datasets

3.5. Simulation, Experimental or Visualization Tools

Chapter 4: Writing Research Papers and Making Presentations (6 hrs)

4.1. Structure of Good Quality Papers, Citations and References

4.2. Making Excellent Presentation

4.3. How to Write Good Quality Thesis and Papers (Journal and Conferences)

Chapter 5: Research Ethics (4 hrs)

5.1. Ethical Issues in Research

5.2. Plagiarism, Falsification, Fabrication

5.3. Academic Honesty Related Issues – Ex. Misleading Authorship

5.4. Other Ethical Issues in Computing

Chapter 6: Data Collection and Analysis (6 hrs)

6.1 Data Collection (primary and secondary data)

6.2 Analysis of Data with case studies

Assessment methods

Assignment/quizzes	20 %
Research report	20
Mid semester examination	20%
Final examination	40%

Text books and References

General textbooks are not suitable for this course, but there are a growing number of research papers research published in quality journals such as IEEE and ACM that explore models, frameworks as well as contents in Computing Research Methods to help students to become an expert in computing.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Final Year Project I				**Course Code:** CoSc4125	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	0	0	0
Course Prerequisite:	Software Engineering (CoSc3061)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course involves identifying a problem, studying the problem, gathering data and relevant materials

and an open presentation of the development of the project work

Course objectives

At the end of project, the student will be able to formulate project problem or prove conjecture, do independent literature reading, write project proposal, doing requirement analysis and modeling, present project documentation (RAD & SDD).

Course outline

Chapter 1: Introduction

1.1. Background of the Organization
1.2. Statement of the Problem and Justification
1.3. Objective of the Project
    1.3.1. General Objective
    1. 3.2. Specific Objective (s)
1.4. Methodologies
1.5. Tools
1.6. Scope and Limitation
1.7. Significance of the Project

1.8. Feasibility Study

1.9. Risk Assessment

1.10. Work Break Down

Chapter 2: Requirement Analysis and Specification

2.1 Current system

2.2 Business rules

2.3 Proposed system

2.3.1 Overview

2.3.2 Functional requirements

2.3.3 Nonfunctional requirements

2.3.4 System models

2.3.4.1 Use case model

2.3.4.2 Sequence diagram

2.3.4.3 State chart diagram

2.3.4.4 Activity diagram

2.3.4.5 Class diagram

2.3.4.6 User interface prototyping

Chapter 3: System Design

3.1 Introduction

3.2 Purpose of the system

3.3 Design goals

3.4 Current software architecture

3.5 Proposed software architecture

3.5.1 Subsystem decomposition

3.5.2 Component diagram

3.5.3 Deployment diagram

3.5.4 Persistent data management

3.5.5 Access control and security

3.5.6 Global software control

3.5.7 Boundary conditions

Assessment methods

- Advisor evaluation – 35%
- Jury evaluation – 65%

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Computer Security				**Course Code:** CoSc4035	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Data Communications and Computer Networks (CoSc2032)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

To familiarize students with the security issues and technologies involved in modern information systems, including computer systems and networks and the various ways in which information systems can be attacked and tradeoffs in protecting networks.

Course objectives

By the end of this course, students will be able to:

- Understand the basic concepts in information security, including security attacks/threats, security vulnerabilities, security policies, security models, and security mechanisms
- Understand the concepts, principles and practices related to elementary cryptography, including plain-text, cipher-text, the four techniques for crypto-analysis, symmetric cryptography, asymmetric cryptography, digital signature, message authentication code, hash functions, and modes of encryption operations.
- Understand issues related to program security and the common vulnerabilities in computer programs; including buffer overflow vulnerabilities, time-of-check to time-of-use flaws, incomplete mediation.
- Explain and compare security mechanisms for conventional operating systems, including memory, time, file, object protection requirements and techniques and protection in contemporary operating systems.

- Understand the basic requirements for trusted operating systems, and describe the independent evaluation, including evaluation criteria and evaluation process.
- Describe security requirements for database security, and describe techniques for ensuring database reliability and integrity, secrecy, inference control, and multi-level databases.
- Describe threats to networks, and explain techniques for ensuring network security, including encryption, authentication, firewalls, and intrusion detection.
- Explain the requirements and techniques for security management, including security policies, risk analysis, and physical threats and controls.

Course outline

Chapter 1: Introduction to Computer Security (3 hrs)

1.1 Basic concepts of computer security

1.2 Threats, vulnerabilities, controls, risk

1.3 Goals of computer security

1.4 Security attack

1.5 Security policies and mechanisms

1.6 Prevention, detection, and deterrence

1.7 Software security assurance

Chapter 2: Computer Threat (4 hrs)

2.1 Malicious code

2.1.1 Viruses

2.1.2 Trojan horses

2.1.3 Worms

2.1.4 Spy-wares, etc.

2.2 Class of Attacks

2.2.1 Reconnaissance

2.2.2 Access

2.2.3 Denial of Service, etc.

2.3 Program flaws

2.3.1 Buffer overflows

2.3.2 Time-of-check to time-of-use flaws

2.3.3 Incomplete mediation

2.4 Controls to protect against program flaws in execution

2.4.1 Operating system support and administrative controls

2.5 Program Security Defenses

2.5.1 Software development controls and Testing techniques

2.5.2 Database management systems security

Chapter 3: Cryptography and Encryption Techniques (13 hrs)

3.1 Basic cryptographic terms

3.2 Historical background

3.3 Cipher Techniques

3.3.1 Transposition Cipher

3.3.2 Substitution Cipher

3.4 Conventional encryption algorithms

3.5 Cryptanalysis

3.6 Cryptographic Systems

3.6.1 Symmetric key cryptography

3.6.1.1 DES

3.6.1.2 3DES

3.6.1.3 AES

3.6.1.4 Block Cipher Modes

3.6.2 Public key cryptography

3.6.2.1 Diffie-Hellman

3.6.2.2 RSA

3.6.3 Digital Signature

3.6.3.1 Using Public Key

3.6.3.2 Using Message Digest

3.6.3.2.1 MD4family

3.6.3.2.2 SHA family

3.6.3.2.3 RIPEMD

3.6.4 Public key Infrastructure (PKI)

3.6.4.1.1 Trusted Third Party

3.6.4.1.2 Certification

3.6.4.1.3 Key Distribution

3.6.4.1.4 PKI Topology

3.6.4.1.5 Enrollment and Revocation Procedures

Chapter 4: Network Security (4 hrs)

4.1 Network security basics

4.2 Threats on network

4.3 Trust, Weaknesses, Risk and Vulnerabilities

4.4 TCP/IP Suit Weaknesses and Buffer Overflows

4.5 Network security protocols

4.5.1 Application layer security

4.5.1.1 Web security

4.5.1.2 E-mail security

4.5.2 Transport layer security

4.5.3 Network layer security

4.5.4 Link layer security

4.5.5 Physical security

4.6 Wireless security

Chapter 5: Security Mechanisms (3 hrs)

5.1 Firewall

5.2 Proxy server

5.3 IDS/IPS

5.4 Virtual Private network

Chapter 6: Authentication and Access control (3 hrs)

6.1 Authentication basics

6.1.1 Password and Passphrase

6.1.2 Biometrics

6.1.2.1 Fingerprint

6.1.2.2 Palm Scan

6.1.2.3 Hand Geometry

6.1.2.4 Iris Scan

6.1.2.5 Signature Dynamics

6.1.2.6 Voice Print

6.1.2.7 Facial Scan

6.1.2.8 Hand Typography

6.1.3 AAA server

6.1.4 Smart card and memory cards

6.1.5 Kerberos

6.2 Access control basics

6.3 Access control models

6.3.1 Discretionary Access Control (DAC)

6.3.2 Mandatory Access Control (MAC)

6.3.3 Role-Based Access Control (RBAC)

Chapter 7: Administering security (2 hrs)

7.1 Security planning

7.2 Risk analysis

7.3 Security policies

7.4 Cyber security

7.5 Ethics

Lab content: using OpenSSL

Lab 1: Installing and configuring OpenSSL

Lab 2: Introduction and commands used in OpenSSL

Lab 3: Encryption using conventional algorithms

Lab 4: Symmetric encryption with OpenSSL

Lab 5: Encrypting file using DES

Lab 6: Asymmetric encryption with OpenSSL

Lab 7: Encrypting file using RSA

Lab 8: Combination of DES and RSA

Lab 9: Digital Certification with OpenSSL

Lab 10: Digital Signature

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

- Security in Computing, Charles P. Pfleeger and Shari L. Pfleeger. (3rd edition), Prentice-Hall, 2003

References:

1. Computer Security, Dicter Gouman, John Wiley & Sons
2. Computer Security: Art and Science, Mathew Bishop, Addison-Wesley
3. Principles of Information Security, Whitman, Thomson.
4. Network security, Kaufman, Perl man and Speciner, Pearson Education
5. Cryptography and Network Security, 5th Edition William Stallings, Pearson Education
6. Introduction to Cryptography, Buchmann, Springer.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Introduction to Distributed Systems				**Course Code:** CoSc4038	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Operating Systems (CoSc3023) &Data Communications and Computer Networks (CoSc2032)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

A distributed system is a computer system consisting of several independent computers, connected by a network, that can work together to perform a task or provide a service. Typical examples include: the World Wide Web, networked file systems, DNS, and massive multiprocessor supercomputers. In this course we will focus on the principles, techniques, and practices relevant to the design and implementation of such systems. The course takes a systems-oriented view of distributed systems, concentrating on infrastructure software and providing hands-on experience of implementing distributed systems.

Course objectives

After completing this course, you will be able to:

- Explain what a distributed system is, why they would design a system as a distributed system, and what the desired properties of such systems are;
- List the principles underlying the functioning of distributed systems describe the problems and challenges associated with distributed systems, and evaluate the effectiveness and shortcomings of their solutions;
- Recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design

- Design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.)
- Understand and exercise on distributed system software development using basic OS mechanisms as well as higher-level middleware and languages.

Course outline

Chapter 1: Introduction (2 hrs)

1.1. Introduction

1.2. Definition

1.3. Goals of a Distributed System

1.4. Types of Distributed Systems

Chapter 2: Architectures (4 hrs)

2.1 Introduction

2.2 Architectural Styles

2.3 System Architectures

Chapter 3: Processes (4 hrs)

3.1. Introduction to Threads

3.2. Threads in Distributed Systems

3.3. Clients

3.4. Servers

3.5. Code Migration

Chapter 4: Communication (6 hrs)

4.1. Layer protocols

4.2. Types of Communication

4.3. Remote Procedure Call

4.4. Remote Object invocation

Chapter 5: Naming (4 hrs)

5.1. Naming Entities

5.2. Flat Naming

5.3. Structured Naming

5.4. Attribute based naming

Chapter 6: Synchronization (4 hrs)

6.1. Overview

6.2. Clock Synchronization

6.3. Physical Clocks

6.4. Logical Clocks

Chapter 7: Consistency and Replication (4 hrs)

7.1. Introduction to Consistency

7.2. Reasons for Replication

7.3. Replication as Scaling Technique

Chapter 8: Fault Tolerance (4 hrs)

8.1. Basic Concepts

8.2. Failure Models

8.3. Process Resilience

8.4. Distributed Commit

8.5. Recovery

Lab contents: Using Java programming language

Lab 1: Implementation of socket programming

Lab 2: Implementation of Client Server based program using RMI

Lab 3: Implementation of Client Server based program using RPC

Lab 4: Implementation of Clock Synchronization (logical/physical)

Lab 5: Implementation of Election algorithm

Lab 6: Implementation of Mutual Exclusion algorithms

Lab 7: Implementation of multi-threaded client/server processes

Lab 8: Write Program to demonstrate process/code migration

Lab 9: Write a distributed application using EJB

Lab 10: Write a program using CORBA to demonstrate object brokering

Lab 11: Use .Net framework to deploy a distributed application

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

Andrew S. Tanenbaum and Maarten van Steen, "Distributed Systems, Principles and Paradigms", 2nd edition, Prentice Hall, 2007.

References:

1. G. F. Coulouris, J. Dollimore and T. Kindberg. Distributed Systems: Concepts and Design, 5th Ed, Addison-Wesley, 2005.
2. Sukumar Ghosh, Distributed Systems: An Algorithmic Approach, Second Edition
3. A.D. Kshemkalyani, M. Singhal, Distributed Computing: Principles, Algorithms, and Systems, ISBN: 9780521189842, Cambridge University Press, March 2011.
4. Hagit Attiya, Jennifer Welch. Distributed Computing: Fundamentals, Simulations, and Advanced Topics
5. Gerard Tel. Introduction to Distributed Algorithms
6. K. Birman, Building Secure and Reliable Network Applications, Manning Publications Co., 1996

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Selected Topics in Computer Science				**Course Code:** CoSc4132	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

The motivation for this course lies in the interest in providing a broad viewpoint on Compute science by surveying recent developments, major results, and hot topics in today's leading-edge research in computer science. 2 to 3 topics of current interest in computer science have to be selected. These topics will prepare students with the knowledge, skills, and attitudes essential for working in the field of computer science. The course might cover topics such as semantic web, blockchain technology, pervasive, mobile and social computing, Internet of Things, cloud computing, neural network, Big data, etc. This course must prepare students for advancement in this career field and should provide students with good opportunities.

Course objectives

On successful completion of the course, students will be able to understand current hot topics in Computer science and critically discuss the selected topics.

Assessment methods

Assignment/quizzes	20 %
Mid semester examination	30%
Final examination	50%

Textbooks and References:

This course does not have a single all-encompassing textbook and references. It is, thus, recommended that the students read appropriate books from the given reading materials.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Real Time and Embedded Systems				**Course Code:** CoSc3026	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	2
Course Prerequisite:	Microprocessor and Assembly Language Programming (CoSc 3025) &, Operating Systems (CoSc3023)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: III/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course provides an overview of the unique concepts and techniques needed to design and implement computer systems having real-time response requirements in an embedded environment. It contrasts the concepts and techniques of real-time and embedded systems with those of more traditional computer systems. Topics include Basic concepts of real-time and embedded systems, hardware features, sensors and actuators, programming languages, real-time operating systems, Cyclic scheduling and priority-based scheduling, concurrent multitasking, time-sharing access to resources, real-time applications, fault- tolerance, deterministic behavior, design with general and specific microprocessors, hardware/software integration, embedded systems synchronization techniques, performance optimization, and current trends in real-time and embedded systems such as incorporating internet connectivity.

Course objectives

The course provides the opportunities for students to learn major issues in real-time and embedded system. The objectives are:

- To identify the major differences and design challenges for real-time and embedded systems compared to traditional performance-based computing systems.

- To understand and be skillful in the analysis of scheduling algorithms for real-time computing, including the techniques to evaluate worst-case delays and utilization bounds.
- To be able to apply model-driven development approaches to construct target execution environment for simulation analysis and rapid prototyping, and to verify real-time requirements.
- Evaluate, compare, and contrast different scheduling algorithms and real-time and embedded kernel designs.
- Apply knowledge of real-time and embedded system concepts to address an open research question in real-time and embedded systems and related fields.

Course outline

Chapter 1: Introduction (6 hrs)

1.1 Definitions, characteristics and examples of real-time and embedded systems

1.2 Model of real time system

1.3 Types of real time tasks

1.4 Modeling timing constraints

1.5 Computer organization concepts and memory

1.6 Design process

Chapter 2: Embedded System Architecture (8 hrs)

2.1 Hardware architectures for embedded systems

2.2 ARM Cortex M0+ Hardware Overview: Ports, Registers, GPIO, Analog I/O, ADC/DAC

2.3 Communication: Parallel, USB/Serial, USART, SPI, TWI, Ethernet, Wireless

2.4 ATmega32 microcontroller Architecture

2.5 Assembly language Programming with ATmega32 Instruction Set

2.6 Programming in C to Interface peripherals, Interrupts, ISR and Timers

Chapter 3: Software Frameworks for Real-time and Embedded Systems (8 hrs)

3.1 Real-time operating system: definitions, Characteristics, functionality, structure and support for applications

3.2 Features of a real time operation system

3.3 General and specific microprocessors

3.4 Inter process communication

3.5 Real time task scheduling

3.6 Dynamic allocation of tasks

3.7 Scheduling

3.7.1 Cyclic scheduling

3.7.2 Priority-based scheduling

3.8 Multi-tasking and Concurrency issue

3.9 Handling resource sharing and dependencies

3.9.1 Priorities and reentrancy

3.9.2 Resource sharing protocols

3.10 Fault- tolerance

3.11 Synchronization techniques

3.11.1 Centralized clock synchronization

3.11.2 Distributed clock synchronization

3.12 Real-time applications

3.13 RTOS support for semaphores, queues, and events

Chapter 4: Embedded Systems Design Issues (6 hrs)

4.1 Memory management

4.2 Hardware development

4.3 Software development

Chapter 5: Real-time Communication (4 hrs)

5.1 Basic concepts and examples of real time communication

5.2 Real time communication in LAN

5.3 Bounded access protocol

5.4 Real time communication over internet

5.5 Internet of Things(IoT)

5.6 Sensor and actuators

5.7 Resource reservation

5.8 Traffic shaping and policing

5.9 Scheduling mechanisms-QoS models

Lab contents: software: Atmel Studio 7.0 or above from www.atmel.com, Proteus Professional, and Hardware: ARDUINO328P Kit

Lab-1: Assembly language Programming with data transfer instructions
Lab-2: Assembly language Programming with Branch, call, delay, stack instructions
Lab-3: Assembly language Programming with arithmetic and logic, rotation, instructions, BCD, ASCII conversions
Lab-4: C Programming for data transfer through ports, LED, 7-Segment display.
Lab-5: C Programming with Timer and Interrupts
Lab-6: C Programming for serial and parallel communication
Lab-7: C Programming for Interfacing Peripherals
Lab-8: Building Arduino from Scratch
Lab-9: Implement Sensor Actuator
Lab-10: Develop sample real-time application

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

1. The AVR Microcontroller and Embedded Systems using assembly and C "by Muhammed Ali Mazidi et.al. Prentice Hall, 2011.
2. Hard Real-Time Computing Systems: Predictable Scheduling Algorithms and Applications, Giorgio C. Buttazzo, Springer, Second/Third Edition, 2004/2011.
3. Jane Liu, Real-time Systems, Prentice Hall; ISBN: 0130996513.

References:

1. Real-Time Systems, C.M. Krishna and K.G. Shin, McGraw Hill, 1997.
2. High-Embedded Computing: Architectures, Applications, and Methodologies. Wayne• Wolf, Morgan-Kaufman, 2007.
3. "Embedded C Programming and the Atmel AVR", Richard Barnett, Larry O'Cull, Sarah Cox, 2nd Ed., DELMAR CENAGE Learning, 2007
4. Embedded Systems –Architecture, Programming and Design by Raj Kaml,2nd ed., Tata McGraw Hill publication

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Final Year Project II				**Course Code:** CoSc4126	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	0	0	0
Course Prerequisite:	Final Year Project I (CoSc4125)				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

On this phase, students have to writing the code based on the design they have created in Final Year Project I. You can use any programming language but if the system is designed in Object Oriented methodology, the implementation should be based on classes and hence you should use object-oriented programming language. Testing and evaluation has to be done at the end to the project.

Course outline

Final Year Project II is implementation and testing phase of Final Year Project I

Assessment methods

- Advisor evaluation – 35%
- Jury evaluation – 65%

13.2. Elective Computer Science Courses

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Introduction to Data Mining and Data Warehousing				**Course Code:** CoSc4112	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Probability and Statistics (STAT2015)				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

Today's data acquisition devices, computers and networks are generating data to an unprecedented level that cries for the utilization of powerful, adaptive and intelligent learning algorithms in order to accomplish various challenging tasks such as pattern recognition, time series modeling, optimization, decision support, diagnosis, text mining, and multimedia searching etc. In this course, advanced methods in the context of dimension reduction, feature extraction and selection, clustering, and classification will be explored. The interrelationship between these methods will be addressed, and the mixture-of expert approach and classification combination theory will be discussed.

Course objectives

On successful completion of the module students will be able to:

- Understand the concept of data warehouse and data mining
- Understand the different data mining functionalities: Association, Classification, Clustering, etc
- Understand the data warehouse operations: Slicing, dicing, pivoting, rolling up, rolling down, etc

- Understand and use data mining modeling techniques such as CRISP-DM
- Develop skill on how to measure performance of data mining system
- Develop skill to measure the goodness of the data set for decision making
- Develop confidence in doing research in the area of data mining and data warehousing
- Develop and test data mining systems
- Develop team work spirit

Course outline

Chapter 1: Overview (4 hrs)

1.1 Brief description of data mining
1.2 Data warehousing, data mining and database technology
1.3 Data mining vs Statistics
1.4 Challenges in Data Mining
1.5 Application of data mining
1.6 Data mining functionality
1.7 Are all the patterns interesting?

Chapter 2: Data Warehousing and OLAP technologies (4 hrs)

2.1 What is Data Warehouse?
2.2 Data Warehouse vs. Operational DBMS
2.3 OLTP vs. OLAP
2.4 Design of a Data Warehouse
2.5 From Tables and Spreadsheets to Data Cubes
2.6 Data Cube: A Lattice of Cuboids
2.7 Conceptual Modeling of Data Warehouses
2.8 A Data Mining Query Language, DMQL
2.9 Measures in Data warehouses
2.10 Concept Hierarchy and Data Warehouses
2.11 Typical OLAP Operations
2.12 A Star-Net Query Model
2.13 Data Warehouse Design Process
2.14 Data Warehouse Models
2.15 OLAP functionalities on Data warehouses

Chapter 3: Data Preprocessing (6 hrs)

3.1 Description
3.2 Descriptive data summarization

3.3 Major Tasks in Data Preprocessing

3.3.1 Data cleaning

3.3.2 Data integration

3.3.3 Data transformation

3.3.4 Data reduction

3.3.5 Discretization

3.3.6 Concept hierarchy generation

Chapter 4: Association Rule Mining (6 hrs)

4.1 Description of Association Rule

4.2 Frequent Pattern and association rule mining

4.3 Association rule evaluation

4.4 Issues in Association rule mining

4.5 Classification of Frequent Pattern Mining

4.6 Mining Frequent Item set

4.7 Algorithm to find Frequent Item set

4.7.1 The Apriori Algorithm

4.8 Generating Association Rules from Frequent Item sets

4.9 Mining Multi-Level Associations Rules

4.10 Mining Multi-Dimensional Association Rule

Chapter 5: Classification and prediction (6 hrs)

5.1 Description of prediction and classification problems

5.2 Issues in Classification

5.3 Classification Algorithm

5.3.1 Decision Tree (ID3, C4.5, CART)

5.3.2 Naïve Bayesian Classification

5.3.3 Bayesian Belief Network

5.3.4 K-Nearest-Neighbor

5.3.5 Artificial Neural Network (ANN)

5.4 Dataset preparation for Classification

5.5 Building Classification Model

5.6 Evaluation of DM classification System

5.7 Evaluation of the dataset

5.8 Evaluation of Classification Performance

5.9 Linear Regression

5.10 Nonlinear Regression

5.11 Other Regression-Based Methods

Chapter 6: Cluster Analysis & Applications of Data Mining (6 hrs)

6.1 Introduction

6.2 Similarity and Dissimilarity between Objects

6.3 Major Clustering Approaches

6.4 Partitioning method Approach

6.4.1 The K-Means Clustering Method

6.5 Model-based

6.5.1 Expectation maximization

6.6 Hierarchy algorithms

6.7 Agglomerative Hierarchical Clustering

6.8 Divisive Hierarchical Clustering

6.9 Distance measure between clusters

6.10 Density-based

6.11 Grid-based

6.12 Data Mining for Financial Data Analysis

6.13 Retail Industry

6.14 Telecommunication Industry

6.15 Biological Data Analysis

6.16 Intrusion Detection

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

- Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, 2nd edition, Morgan Kaufmann, 2006.

References:

1. Refaat, Markus Schneider, Toby Teorey, and Ian Witten, Data Mining: Know It All, Morgan Kaufmann, 2008.
2. K. Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, Data Mining: A Knowledge Discovery Approach, Springer, 2007.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Human Computer Interaction				**Course Code:** CoSc4075	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

A key component to the discipline of Computer Science is the understanding and the advocacy of the user in the development of CS applications and systems. CS graduates must develop a mind-set that recognizes the importance of users and organizational contexts. They must employ user-centered methodologies in the development, evaluation, and deployment of Computer applications and systems. This requires graduates to develop knowledge of HCI, including but not limited to such areas as user and task analysis, human factors, ergonomics, accessibility standards, and cognitive psychology.

Course objectives

At the end of the course, the student should be able to do the following:

- Describe the relationship between the cognitive principles and their application to interfaces and products.
- Explain the conceptual terms for analyzing human interaction with products such as affordance, conceptual model, and feedback.
- Analyze different user populations with regard to their abilities and characteristics for using both software and hardware products.
- Describe the connection between the development of a user interface and the user's knowledge of an application domain.
- List several of the emerging alternative I/O devices for computers

Course outline

Chapter 1: Introduction (4 hrs)

1.1 Definition

1.2 Historical background

Chapter 2: Human in HCI (4 hrs)

2.1 Information input/output

2.2 Memory

2.3 Reasoning, problem solving, skill and error

2.4 Emotion

2.5 Individual difference

Chapter 3: Computer in HCI (6 hrs)

3.1 Input device

3.2 Output device

3.3 Virtual reality

3.4 Physical interaction

3.5 Paper

3.6 Memory

3.7 Processing

Chapter 4: Interaction (6 hrs)

4.1 Introduction

4.2 Models of interaction

4.3 Ergonomics

4.4 Interaction styles

4.5 The context of the interactions Paradigms

Chapter 5: Interaction Design and HCI in the Software Process (6 hrs)

5.1 Interaction Design

5.2 HCI in the Software Process

Chapter 6: Design Rules and Implementation support (6 hrs)

6.1 Design Rules

6.2 Implementation Support

Chapter 7: Evaluation Techniques and Universal Design (8 hrs)

7.1 Evaluation Techniques

7.2 Universal Design

Chapter 8: User Support (8 hrs)

8.1 Requirements of user support

8.2 Approaches to user support

8.3 Adaptive help systems

8.4 Designing user support systems

Assessment methods

Assignment/quizzes	20 %
Mid semester examination	30%
Final examination	50%

Text books and references:

Dix, A., Finlay, J., Abowd, G. and Beale, R. Human-computer interaction

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Event Driven Programming				**Course Code:** CoSc4055	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	None				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This is a course in event-driven programming building on prior programming experience. The course covers topics in control arrays, exception handling, and the use of properties, controls, and multiple forms. Introduces database manipulation and database controls, including use of database linking and programming applications to display, edit, and update databases by use of the data access object. This course uses advanced programming tools such as Visual Studio .Net

Course objectives

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

- Demonstrate knowledge of a high-level object oriented programming language.
- Demonstrate use of data types in program and systems development.
- Demonstrate knowledge of event-driven programming and systems development.
- Develop well-organized, block-structured, easily read programs.
- Demonstrate ability to design graphical user interfaces (GUI)
- Demonstrate ability to code arithmetic instructions, conditional statements, repetition structures, sub procedures, and control arrays in programs.
- Demonstrate ability to develop programming applications to manipulate databases (including query, display, edit, update functions).
- Demonstrate ability to develop integrated multiform programs.

- Develop appropriate testing procedures and documentation for programs

Course outline

Chapter 1: Introduction (4 hrs)

1.1 Introduction to Software Development

1.2 Software Development Approaches

1.3 Rapid Application Development

1.4 Software Development Principles

Chapter 2: Introduction to .NET (6 hrs)

2.1 The .NET Platform and Its Architecture

2.1.1 Base Class Library

2.1.2 Common Language Runtime

2.2 Uses of .NET Platform in Application Development

2.3 Introduction to Microsoft Visual Studio 2010

2.3.1 SDI and MDI Forms

2.3.2 Controls

Chapter 3: Object-Oriented Fundamentals in VB.NET (8 hrs)

3.1 Language Fundamentals

3.1.1 Variables and Data Types

3.1.2 Control Flow

3.1.3 Methods and Their Types

3.1.4 Events

3.2 Classes and Objects

3.3 Inheritance and Overloading Implementation

3.4 Classes versus Components

Chapter 4: Exception Handling (4 hrs)

4.1 Introducing Exception Handling

4.2 Structured Exception Handling

4.3 Implementing Exception Handling

Chapter 5: Manipulating Files How to open a Text File (4 hrs)

5.1 Read a file line by line in VB .NET

5.2 Write to a Text File

5.3 How to Copy, Move and Delete a File

Chapter 6: Database Programming (6 hrs)

6.1 The ADO.NET Architecture

6.2 LINQ Architecture

6.3 The .NET Data providers

6.4 Working with the common .NET Data providers

6.5 The Dataset Component

6.6 Using the DataGridView for database access

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books and References:

1. An introduction to programming using visual basic 6.0, fourth edition, David I. Schneider Evjen, B et al, (2008). Professional Visual Basic 2008.
2. Crosspoint Boulevard: Wiley Publishing Inc. Gary Cornell and Jonathan Morrison (2002).
3. Programming VB.NET: A Guide for Experienced Programmers. USA: APress Cameron Wakefield, Henk-Evert Sonder and Wei Meng Lee. VB.NET｜Developers Guide. USA: Syngress Publishing, Inc

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Multimedia				**Course Code:** CoSc4077	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	None				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

Multimedia technologies; multimedia storage models and structures; data models and interfaces; multimedia information systems; video/audio networking; media synchronization; image computing and information assimilation; conferencing paradigms and structured interaction support.

Course objectives

At the end of the course, students should:

- Understand the basic concepts of multimedia
- Understand where and how to use multimedia systems
- Design different kinds of multimedia systems
- Write different kinds of code that are used in Multimedia

Course outline

Chapter 1: Introduction (4 hrs)

1.1 What is Multimedia?

1.2 History of Multimedia

1.3 Multimedia and Hypermedia

1.4 Multimedia and World Wide Web

Chapter 2: Multimedia Authoring and Tools (4 hrs)

2.1 What is Multimedia Authoring?

2.2 Some Useful Editing and Authoring Tools

2.3 Authoring Paradigms

Chapter 3: Data Representations (5 hrs)

3.1 Graphics/Image Data Representation

3.2 Digital audio and MIDI

3.3 Popular File Formats

Chapter 4: Image and Video (5 hrs)

4.1 Color Science

4.2 Color Models in Images

4.3 Color Models in Video

Chapter 5: Fundamental Concepts in Video (6 hrs)

5.1 Types of Video Signals

5.2 Analogue Video

5.3 Digital Video

5.4 Different TV standards

Chapter 6: Basics of Digital Audio (hrs)

6.1 Digitization of Sound

6.2 Quantization and Transmission of Audio

Chapter 7: Lossless Compression Algorithms (6 hrs)

7.1 Basics of Information Theory

7.2 Run-Length Coding

7.3 Variable-Length Coding (VLC)

7.4 Dictionary Based Coding

7.5 Huffman Coding

7.6 Arithmetic Coding

7.7 Lossless Image Compression

Chapter 8: Loss Compression Algorithms (6 hrs)

8.1 Distortion Measures

8.2 The Rate Distortion Theory Quantization

8.3 Transform Coding

Chapter 9: Image Compression Standards (6 hrs)

9.1 the JPEG Standard

9.2 Basic Video Compression Techniques

9.3 Introduction to Video Compression

9.4 Video Compression Based on Motion Compensation

9.5 MPEG Video and Audio Coding

9.6 Video Compression

9.7 MPEG Audio Compressions

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books and References:

1. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Prentice Hall, 2004.
2. Richard Brice, Multimedia and Virtual Reality Engineering, Newnes, 1997
3. Jon Crowcroft, Mark Handley, Ian Wakeman; Internetworking Multimedia, Morgan Kaufmann Publishers, San Francisco, California, 1999
4. Doug Sahlin, Flash 5 Virtual Classroom, McGraw-Hill, 2001, California

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Mobile Application Development				**Course Code:** CoSc4083	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Object Oriented Programing (CoSc2052)				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course introduces mobile application development for the Android platform. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Students will learn skills for creating and deploying Android applications, with particular emphasis on software engineering topics including software architecture, software process, usability, and deployment.

Course objectives

Understand the basic principles of mobile application development using android platform

Learning Outcomes

The program provides a knowledge and understanding of the following:

- User-interface design for mobile applications
- Managing application data
- Integrating mobile application with cloud services.
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security.
- Testing methodologies for mobile applications.
- Publishing, deployment, maintenance and management of mobile application.

- Effective communication skill acquired during group work
- A hand on experience on mobile technologies

Course outline

Topic 1. Introduction

- Introduction to Android
- Android application structure
- Android UI architecture [application context, intent, activity lifecycle]
- UI Components [Text control,]

Topic 2. Notification, Menus and Dialogs

- Intents with parameter
- Notification with status bar and toast
- Localization
- Context/option menu
- Alert dialog
- Dialog as activity

Topic 3. Location and Map

- How to work with Google Map
- How to work with GPS

Topic 4. Working with Data Storage

- Shared preference
- Working with files
- Working with SQL light

Topic 5. Content Providers

- Introduction to content provider
- Query provider

Topic 6. Network Communication

- Introduction to web service
- HTTP Client
- XML and JSON

Topic 7. Service

- Service Lifecycle
- Foreground Service

Topic 8. Publishing

- How to prepare for publishing
- Publishing to android market

Teaching Methods

The teaching methods that shall be employed for this course are lecturing, demonstration, classroom discussion and classroom action research.

Assessment Method

Assignment	15%
Lab assessment	15%
Project I and II	40%
Final Exam	30%

Reference

1. Ramnath, Rajiv, Roger Crawfis, and Paolo Sivilotti. Android 3 SDK programming for dummies. Hoboken, N.J. Chichester: Wiley John Wiley distributor, 2011
2. Phillips, Bill, Chris Stewart, and Kristin Marsicano. Android programming : the Big Nerd Ranch guide. Atlanta, GA: Big Nerd Ranch, 2017
3. Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O'ReillyMedia, 2016.
4. Brian Fling, Mobile Design and Development, O'Reilly Media, Inc., 2009.
5. Maximiliano Firtman, Programming the Mobile Web, O'Reilly Media, Inc., 2nd ed., 2013.Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O'Reilly Media, Inc., 2014.
6. Benjamin Muschko, Gradle in Action, Manning Publications, 2014.
7. Craig Larman, Applying UML and Patterns: A Guide to Object-Oriented Analysis and Design and Iterative Development, 3rd ed., Prentice Hall, 2004.

Mobile Application Lab

Week 1- Week 4	Topic 1 ,2	– Installation and configuration – Basics on android studio – UI design – Notification and menu
Week 5- Week 8	Topic 3,4	– Configuration of Google map – Working on Google map – Working on GPS
Week 9- Week 13	Topic 5,6	– Testing query providers – Using web service ,http client and Json
Week 14- Week 16	Topic 7,8	– -how to work on foreground service – How to publish app

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: *Computer Science*					
Course Title: Introduction to Machine Learning				**Course Code:** CoSc4114	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Linear Algebra (MATH2011) & Probability and Statistics (STAT2015)				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

Machine Learning is the study of how to build computer systems that learn from experience. This course will explain how to build systems that learn and adapt using real-world applications. Some of the topics to be covered include concept learning, neural networks, genetic algorithms, reinforcement learning, instance-based learning, and so forth. The course will be project-oriented, with emphasis placed on writing software implementations of learning algorithms applied to real-world problems.

Course objectives

At the end of the course, students should:

- Know about the fundamental concepts in machine learning, the different classes of machine learning algorithms, and ways to choose and apply different basic machine learning algorithms.
- Learn about ways to evaluate the performance of learning systems.
- Be able to prepare data and apply machine learning methods to achieve a learning goal within an intelligent system.
- Be able to judge the suitability of a machine learning paradigm for a given problem and the available data, have an understanding of the capabilities and limitations of the considered machine learning algorithms, and is able to identify problems or misleading results.

Course outline

Chapter 1: Introduction (4 hrs)

- 1.1 What is machine learning?
- 1.2 History and relationships to other fields
- 1.3 Essential math and statistics for machine learning
- 1.4 Applications of machine learning
- 1.5 Types of machine learning techniques

Chapter 2: Supervised learning (8 hrs)

- 2.1 Introduction
- 2.2 Linear model
  - 2.2.1 Regression
  - 2.2.2 Understand the operation regression
    - 2.2.2.1 Linear regression
    - 2.2.2.2 Polynomial regression
    - 2.2.2.3 Regularization techniques
    - 2.2.2.4 Understand the metrics used to evaluate regression
    - 2.2.2.5 A case study in regression
  - 2.2.3 Classification
  - 2.2.4 Understand the operation of classifiers
    - 2.2.4.1 KNN
    - 2.2.4.2 Naïve Bayes
    - 2.2.4.3 Logistic regression
    - 2.2.4.4 Decision trees
    - 2.2.4.5 Random forest
    - 2.2.4.6 Support vector machines
  - 2.2.5 A case study in classification
  - 2.2.6 Understand the metrics used to evaluate classifiers
- 2.3 How to improve supervised models
- 2.4 Parametric models for classification and regression
- 2.5 Understand the problems of over-parameterization and the curse of dimensionality
- 2.6 Use regularization on over-parameterized models

Chapter 3: Unsupervised learning (8 hrs)

- 3.1 Introduction
- 3.2 Understand the principles of unsupervised learning models
- 3.3 Clustering approaches
  - 3.3.1 K-Means
  - 3.3.2 K nearest neighbors
  - 3.3.3 Hierarchical clustering
- 3.4 Correctly apply and evaluate clustering models
- 3.5 Association rule learning
  - 3.5.1 Apriori algorithm
- 3.6 Reinforcement learning
  - 3.6.1 Markov decision
  - 3.6.2 Monte Carlo prediction
  - 3.6.3 Case study

Chapter 4: Neural Network (6 hrs)

- 1.1 Introduction
  - 1.1.1 Understanding the brain
  - 1.1.2 Neural networks as a paradigm for parallel processing
- 1.2 The Perceptron
- 1.3 Training a Perceptron
- 1.4 Artificial neural network
- 1.5 Multilayer Perceptron
- 1.6 Back propagation algorithm
  - 1.6.1 Nonlinear Regression
  - 1.6.2 Two-Class Discrimination
  - 1.6.3 Multiclass Discrimination
  - 1.6.4 Multiple Hidden Layers
- 1.7 Training procedures
  - 1.7.1 Improving convergence
  - 1.7.2 Overtraining
  - 1.7.3 Structuring the network
- 1.8 Tuning the network size
- 1.9 A case study in neural network

Chapter 5: Model Evaluation (6 hrs)

- 5.1 Data processing

5.2 Data cleaning and transforming

5.3 Feature selection and visualization

5.4 Model selection and tuning

5.5 Methods of dimensional reduction

5.5.1 Principal component analysis (PCA)

5.5.2 Singular value decomposition (SVD)

5.5.3 T-distributed Stochastic Neighbor Embedding (t-SNE)

5.6 Optimize the performance of the model

5.7 Control model complexity

5.8 Over-fitting and Under-fitting

5.9 Cross-Validation and Re-sampling methods

5.9.1 K-Fold Cross-Validation

5.9.2 5 ×2 Cross-Validation

5.9.3 Bootstrapping

5.10 Gradient descent (batch, stochastic)

5.10.1 Bias, variance

5.11 Performance evaluation methods

5.12 Tool kit

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

Bishop, C. (2006), Pattern Recognition and Machine Learning, Berlin: Springer-Verlag

References:

1. Shalev-Schwartz & Ben-David, Understanding Machine Learning. Cambridge University Press. 2014.
2. Hastie, Tibshirani & Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2nd Edition, Springer, 2009
3. Goodfellow, Bengio &Courville, Deep Learning. MIT Press. 2016

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Introduction to Natural Language Processing				**Course Code:** CoSc4116	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	Automata and Complexity Theory (CoSc3101)				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

This course provides an introduction to the field of computational linguistics, natural language processing (NLP). We will learn how to create systems that can understand and produce language, for applications such as information extraction, machine translation, automatic summarization, question-answering, and interactive dialogue systems. The course will cover linguistic (knowledge-based) and statistical approaches to language processing in the three major subfields of NLP: syntax (language structures), semantics (language meaning), and pragmatics/discourse (the interpretation of language in context).

Course objectives

- To introduce the fundamental concepts and ideas in natural language processing (NLP)
- To develop an in-depth understanding of both algorithms for processing linguistic information and the underlying computational properties of natural languages.
- The course considers word-level, syntactic, and semantic processing from both a linguistic and an algorithmic perspective, aiming to get up to speed with current research in the area

Course outline

Chapter 1: Introduction (2 hrs)

1.1 Natural Language Processing concepts

1.2 Ambiguity and uncertainty in language

1.3 NLP tasks in syntax, semantics, and pragmatics

1.4 Applications of NLP

Chapter 2: Machine learning for Natural Language processing (4 hrs)

2.1 Classification and Regression

2.2 Clustering

2.3 Neural Networks

Chapter 3: Words and Transducers (4 hrs)

3.1 Introduction

3.2 Finite state morphological parsing

3.3 Transducers and orthographic rules

3.4 Minimum edit distance

Chapter 4: Language Modeling (6 hrs)

4.1 Role of language models

4.2 N-grams

4.3 Parts of speech tagging (POST) and sequence labeling

4.4 Word classes

4.5 Hidden Markov (Forward and Viterbi algorithms and EM training)

4.6 Maximum entropy models

4.7 Estimating parameters and smoothing

4.8 Evaluating language models

Chapter 5: Syntactic parsing (6 hrs)

5.1 Grammar formalisms and treebanks

5.2 Efficient parsing for context-free grammars (CFGs)

5.3 Statistical parsing and probabilistic CFGs (PCFGs)

5.4 Lexicalized PCFGs

5.5 Neural shift-reduce dependency parsing

5.6 Language and complexity

Chapter 6: Semantic Analysis (6 hrs)

6.1 Representing meaning

6.2 Computational semantics

6.3 Lexical semantics and word-sense disambiguation

6.4 Compositional semantics

6.5 Semantic Role Labeling and Semantic Parsing

Chapter 7: Application of NLP (4 hrs)

7.1 Information extraction

7.2 Information retrieval

7.3 Machine Translation

7.4 Question-Answering and Dialogue system

7.5 Text summarization

7.6 Text classification

7.7 Speech recognition

7.8 Optical character recognition

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books and References:

1. Christopher Manning and Hinrich Schütze: Foundations of Statistical Natural Language Processing, MIT Press, 1999.
2. Lucja M. Iwanska and Stuart C. Shapiro (eds): Natural Language Processing and Knowledge Representation, MIT Press, 2000.
3. Roland R. Hausser: Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Springer Verlag, 2001.
4. Gerald Gazdar and Chris Mellish: Natural Language Processing in X. Addison-Wesley, 1989

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: *Computer Science*					
Course Title: Simulation and Modeling				**Course Code:** CoSc4079	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	1
Course Prerequisite:	None				
Course Category:	Elective				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: IV/I Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description

Simulation is the art of using tools - physical or conceptual models, or computer hardware and software, to attempt to create the illusion of reality. The discipline has in recent years expanded to include the modeling of systems that rely on human factors and therefore possess a large proportion of uncertainty, such as social, economic or commercial systems. These new applications make the discipline of modeling and simulation a field of dynamic growth and new research.

Course objectives

- Examines the state-of-the-art in recent research into methods of approaching new applications in the field of modeling and simulation
- Provides an introduction to new modeling tools such as differential inclusions, metric structures in the space of models, semi-discrete events, and use of simulation in parallel optimization techniques
- Discusses recently developed practical applications: for example, the PASION simulation system, stock market simulation, a new fluid dynamics tool, manufacturing simulation and the simulation of social structures
- Illustrated throughout with a series of case studies

Course outline

Chapter 1: Basic Concepts and Tools (4 hrs)

1.1. Modeling and simulation: What is it?

1.2. Validity, credibility, tractability and verification

1.3. System state and causal systems

1.4. Static and dynamic systems

1.5. Classification of dynamical systems

1.6. Discrete and continuous simulation

1.7. Deterministic and stochastic systems

1.8. Evolution of simulation software

Chapter 2: Continuous simulation (4 hrs)

2.1. Introduction

2.2 Ordinary differential equations and models of concentrated parameter systems

2.3. Continuous simulation with analog computers

2.4. Numerical methods for ordinary differential equations (ODE)

2.5. Signal flow graphs

2.6. Bond graphs

2.7. Alternative modeling tools and dynamic uncertainty

2.8. Distributed parameter systems

2.9. System dynamics

2.10. Galactic simulations and the N-body problem

Chapter 3: Discrete and combined simulation (4 hrs)

3.1. Are discrete models valid?

3.2. Event modeling of discrete dynamic systems

3.3. Event graphs

3.4. PASION simulation system

3.5. Queuing Model Generator QMG

3.6. Complex system simulator of PASION

3.7. Monte Carlo Simulation

Chapter 4: Differential inclusions in Modeling and Simulation (4 hrs)

4.1. Differential inclusions

4.2. Possible applications

4.3. Differential inclusion solver

4.4. Application in uncertainty treatment

4.5. Uncertain future and differential inclusions

Chapter 5: Fluid dynamics (2 hrs)

5.1. Computational fluid dynamics

5.2. Numerical problems

5.3. The simulation tools

5.4. Examples

5.5. Oscillating gas flow

5.6. Two-dimensional fluid-dynamics models are invalid

Chapter 6: Simulating Phenomena of General Relativity (2 hrs)

6.1. Some basic concepts

6.3. The simulation tool and model time

6.4. Simulation experiments

Chapter 7: Interactions between hostile hierarchical structures (4 hrs)

7.1. Introduction

7.2. The model

7.3. Structures

7.4. The tool and the model implementation

7.5. Simulation of the struggle between terrorist and anti-terrorist organizations

Chapter 8: On a metric structure in the space of dynamic system models (4 hrs)

8.1. Definitions

8.2. DEVS

8.3. Distance between models

8.4. Optimization with the simplex and BFGS algorithms

8.5. A case study of a parallel optimization algorithm

Chapter 9: Multi-server models (4 hrs)

9.1. M/G/1 and other queuing models

9.2. Burke’s theorem

9.3. Network of queues

9.4. Jackson theorem

9.5. SimEvent tool box in MATLAB

9.6. General features of network simulation packages

9.7. Case study of OMNET++/NetSim/ NS2/NS3

Assessment methods

Assignment/quizzes	10 %
Mid semester examination	20%
Project `	20%
Final examination	50%

Text books:

Modeling and Simulation: The Computer Science of Illusion, 2006

13.3. Supportive Courses

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Numerical Analysis				**Course Code:** MATH2082	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	0
Course Prerequisite:	Applied Mathematics I(Math1041)				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: II/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Aims

The course aims at introducing students in finding numerical solutions to problems for which analytical solutions either do not exist or are not readily or cheaply obtainable. It enables students to apply linear algebra and calculus. It also aims to helps student develop programming skills.

Course description

This course covers basic concepts in error estimation, solutions of non-linear equations, solutions of system of linear equations and non-linear equations, finite differences, numerical interpolations, numerical differentiation and numerical integration.

Course objectives

On completion of the course, successful students will be able to:

- understand sources of errors
- identify absolute and relative errors,
- understand a range of iterative methods for solving linear and non-linear systems of equations,
- comprehend the convergence properties of the numerical methods,
- understand the roles of finite differences,

- grasp practical knowledge of polynomial interpolation in numerical differentiation and integration,
- appreciate the application of basic linear algebra and calculus concepts in deriving the numerical algorithms,
- examine how a small change in the data and ill-conditioned algorithms affect the solution of the mathematical problems,
- translate mathematical algorithms into computer programming,
- interpret computer outputs

Course outline

Chapter 1: Basic concepts in error estimation (12 hrs)

1.1 Sources of errors

1.2 Approximations of errors

1.3 Rounding off errors

1.4 Absolute and relative errors

1.5 Propagation of errors

1.6 Instability

Chapter 2: Nonlinear equations (8 hrs)

2.1 Locating roots

2.2 Bisection and False – position methods

2.3 Interpolation and Secant methods

2.4 Iteration Methods

2.5 Conditions for convergence

2.6 Newton-Raphson Method

Chapter 3: System of equations (9 hrs)

3.1 Revision on direct methods for system of linear equations (SLE)

3.2 Indirect methods for SLE

3.2.1 Gauss Jacobi method

3.2.2 Gauss Seidel method

3.3 Systems of non-linear equations using Newton's method

Chapter 4: Finite differences (9 hrs)

4.1 Shift operators

4.2 Forward difference operators

4.3 Backward difference operators

4.4 Central difference operators

Chapter 5: Interpolations (9 hrs)

5.1 Linear interpolation

5.2 Quadratic interpolation

5.3 Lagrange's interpolation formula

5.4 Divided difference formula

5.5 Newton interpolation formula (forward and backward formulas)

Chapter 6: Application of interpolations (5 hrs)

6.1 Finding roots

6.2 Numerical Differentiation

6.3 Numerical Single Integration

6.3.1 Trapezoidal rule

6.3.2 Simpson's rule

6.3.3 Error analysis in Trapezoidal and Simpson's rules

6.4 Numerical Double Integration

6.4.1 Trapezoidal rule

6.4.2 Simpson's rule

6.4.3 Error analysis in Trapezoidal and Simpson's rules

Weeks	Topics to be covered
1-3	Bisection and false position methods
4-5	Bisection and False-position methods
6-7	Fixed-point iteration, Netwton-Raphison and Secant methods
7-9	Gauss-Jacobi and Gauss-Seidel iteration
10	Newton's Method for system of Nonlinear Equations
11	Newton's forward difference and backward interpolation formulae
12-13	Lagrange's interpolation and Newton's divided difference interpolation formulae
14-15	Finding roots and Numerical differentiation
16	Numerical Integration

Teaching- learning methods

Three contact hours of lectures and two hours of computer lab per week. Students do home assignment.

Assessment methods

- Computer lab assignments/quizzes 20%
- Mid semester examination 30%
- Final examination 50%

Teaching materials

Textbooks:

- Burden, R. L. & Faires, J. D. (2005). Numerical analysis. 8 th ed. Thomson Brooks/Cole.
- Chapra, S. C. & Canale, R. P. (2010). Numerical methods for engineers. Boston: McGraw-Hill HigherEducation.
- Gerald, C. F. and Wheatlly, P. O. (2018). Applied Numerical analysis. 7 th ed., Edsion Wesley, Co.

Reference:

- Atkinson, K. E. (2008). An introduction to numerical analysis. John wiley & sons.
- Chapra, S.C. and Raymond, P.C. (1998). Numerical Methods for Engineering. 9 th ed., McGraw-Hill, New York.
- Gerald, C.F. & Wheatley, P.O. (1994). Applied Numerical Analysis. 5 th ed., Edison Wesley.
- Grewal, B.S. (1994). Numerical Methods in Engineering and Science. Khanna, New Delhi.
- Kiusalaas, J. (2005). Numerical methods in Engineering with MATLAB. Cambridge University Press.
- Ralston, A., & Rabinowitz, P. (2001). A first course in numerical analysis. Courier Corporation.
- Shanthakumar, M. (1987). Computer Based Numerical Analysis. Mysore.
- Stoer, J., & Bulirsch, R. (2013). Introduction to numerical analysis (Vol. 12). Springer Science & Business Media.
- Yang, Won-young (2005). Applied Numerical Methods Using MATLAB. John Wiley & Sons

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Mathematics for Natural Science				**Course Code:** Math1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	2
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Aims

The course intends to prepare mathematics students in the basic concepts and materials necessary for the study of higher mathematics courses. It treats topics rigorously in order to lay a strong foundation for the study of all mathematics courses.

Course description

This course rigorously discusses the basic concepts of logic and set theory, the real and complex number systems, mathematical induction, least upper bound and greatest lower bound, functions and types of functions, polynomial and rational functions, logarithmic and exponential functions, trigonometric functions, hyperbolic functions and their graphs, and analytic geometry.

Course objectives

On completion of the course, successful students will be able to:

- understand mathematical logic,
- apply logic in reasoning and mathematical proofs,
- use quantifiers in open propositions,
- understand concepts of sets and set operations,
- understand the fundamental properties of real and complex numbers,
- find least upper bound and greatest lower bound,
- use mathematical induction in proofs,
- write polar representation of complex numbers,

- understand different types of functions, their inverses and graphs,
- find zero's of some polynomials,
- identify various forms of conic sections and derive their equations,
- use basic properties of logarithmic, exponential, hyperbolic, and trigonometric functions.

Course outline

Chapter 1: Logic and set theory (12 hrs)

1.1 Definition and examples of proposition

1.2 Logical connectives

1.3 Compound (or complex) propositions

1.4 Tautology and contradiction

1.5 Open proposition and quantifiers

1.6 The concept of a set and the underlying set operations

Chapter 2: The real and complex number systems (12 hrs)

2.1 The real number system

2.1.1 The natural numbers, Principle of mathematical induction and the Well ordering principle

2.1.2 The integers, rational numbers and irrational numbers

2.1.3 Upper bound, lower bound, lub, glb, completeness property of the set of real numbers, and the Archimedean principle

2.2 Complex number system

2.2.1 Definition of complex numbers and the underlying operations

2.2.2 Polar representation of complex numbers and the De-Moiver's formula

2.2.3 Extraction of roots

Chapter 3: Functions (12 hrs)

3.1 Review of relations and functions

3.2 Real-valued functions and their properties

3.3 Types of functions (one-to-one, onto) and inverse of a function

3.4 Polynomials, zero's of polynomials, rational functions, and their graphs

3.5 Definitions and basic properties of logarithmic, exponential, hyperbolic, trigonometric functions, and their graphs.

Chapter 4: Analytic geometry (28 hrs)

4.1 Division of segments and various forms of equation of a line

4.2 Conic sections: Equation of a circle, parabola, ellipse and hyperbola

4.3 The general second-degree equation

Teaching –learning methods

Four contact hours of lectures and two hours of tutorials per week. Students do home assignments.

Assessment methods

- Assignment/quizzes 20%
- Mid semester examination 30%
- Final examination 50%

Teaching materials

Textbooks:

Abera Abay (1998). *An introduction to Analytic Geometry*. *AAU.*

Alemayehu Haile and Yismaw Alemu (1993). *Mathematics an Introductory course.*

Department of mathematics, AAU

Reference:

Barnett, R. A. (1999). Precalculus, functions and graphs. McGram Hill.

Bettinger, M. L. (1982). Logic, proof and sets. Adddison-Wesley.

Kinfe Abraha (2002*). Basic Mathematics. Mekelle University, Mega Printing Press, Mekelle, Ethiopia.*

Swokowski, E., & Cole, J. (2011). *Precalculus: Functions and graphs*. Cengage Learning.

Zill, D., & Dewar, J. (2011). *Algebra and Trigonometry*. Jones & Bartlett Publishers.

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: Computer Science					
Course Title: Applied Mathematics I				**Course Code:** Math1041	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course objectives: At the end of this course, the students will be able to:

- Describe matrices, rank of matrix and determinants
- Perform different operations on matrices
- Develop techniques of solving system of linear equations
- Explain different types of matrices and their inverse
- Describe the principles of vectors and scalars
- Describe limit and continuity
- Develop different techniques and rules of differentiation and integration
- Evaluate extreme values of functions
- Compute area, volume, arc length, surface area by applying integration

Course Contents

Chapter 1: Matrices and determinants

1.1 Matrices

1.1.1 The algebra of matrices

1.1.2 Types of matrices

1.1.3 Inverse of matrix

1.1.4 Rank of a matrix

1.1.5 Systems of equations, Gaussian elimination, solving systems of equation by Gaussian elimination

1.2 Determinants

1.2.1 Definition and properties of determinants

1.2.2 Cramer's rule

Chapter 2: Vectors

2.1 Definition of vectors

2.2 Vectors in 2 and 3 spaces

2.3 Scalar product, norm of a vector

2.4 Lines and planes

2.5 Vector product

Chapter 3: Limit and continuity

3.1 Limit definitions and examples

3.2 Basic limit theorems

3.3 Different types of limits

3.4 Continuity

3.5 The intermediate value theorem

Chapter 4: Derivatives

4.1 Definitions and rules

4.2 Differentiability

4.3 The chain rule

4.4 Derivative of sum, product and quotient of functions

4.5 Derivatives of inverse functions

4.6 Higher derivatives

4.7 Implicit differentiation

Chapter 5: Application of derivative

5.1 Rates of change

5.2 Mean value theorem and their applications.

5.3 The First and second derivative test and their applications

5.4 Extreme of a function and its application

5.5 Curve sketching

5.6 L'Hôpital's Rule

Chapter 6: The Integral

6.1 The Indefinite integrals and its properties

6.2 Fundamental theorems of calculus

6.3 Change of variables

6.4 Indefinite integrals

6.5 Techniques of integration

6.6 Improper integrals

6.7 Applications of integration (Area, and volume of region)

Assessment Methods

1. Quiz, Test and mid-exam …….....30%

2. Assignment and Presentation …….……....20%

3. Final Exam ……...…….50%

Total…….....100%

Course policy: A student has to:

- Attend at least 85% of the classes,
- Take all continuous assessments and take final examination,
- Respect all rules & regulations of the university.

References

- R. Ellis and D. Gluck, Calculus with Analytic Geometry
- Edwards &Penney, Calculus with analytic geometry
- S.Lang: Linear Algebra, 3rd Edition
- Kereyszing: Advanced Engineering mathematics

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: Computer Science					
Course Title: Probability and Statistics				**Course Code:** STAT2015	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	1
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

There is a need for students understanding of the basic concepts in the introductory statistics and probability module so that students develop an important basic statistical skill. In the modern scientific and technological world, it is even more important to understand probabilistic arguments. The skill students develop after taking this module is an important basic skill because in everyday life they will constantly be exposed to information from surveys and scientific experiments. The module will provide skills that will not only enable students to know whether these findings are accurate and make sense of the information with which they are presented but also understand basic probabilistic arguments Courses in quantitative and logical skills develop logical reasoning, including the ability to identify valid arguments, use mathematical models, and draw conclusions based on quantitative data.

Course objectives

Upon the completion of the module, Students will be able to:

- demonstrate statistical techniques through principles of data collection, descriptive statistics, probability and sampling distributions; statistical inference and linear regression;
- Show different schemes of presenting the collected data and interpretation of the result.
- familiar with some standard discrete and continuous probability distributions;
- use standard statistical tables for the Normal, t, chi-square distributions;
- discuss some desirable properties of point estimators;
- demonstrate the framework of estimation and hypothesis testing to carry out statistical inference;
- construct and interpret interval estimate and tests hypotheses correctly in some simple cases;
- interpret the results of statistical analyses correctly and in non-technical language;
- have basic skills in exploratory data analysis;

- familiarize themselves with basic concepts of probability and laws of the same;
- define joint, marginal and conditional distribution and independent random variables;
- drive functions of random variables and construct their probability distributions
- compute expectation, variance and correlation of random variables;
- Familiar with standard discrete and continuous probability distributions and their applications.

Course outline

1. **Introduction (2 lecture hour)**
   - 1.1. Definitions and classification of statistics
   - 1.2. Stages in statistical investigation
   - 1.3. Definition of some terms
   - 1.4. Applications, uses and limitations of statistics
   - 1.5. Scales of measurement
2. **Methods of data collection and presentation (2 lecture hour)**
   - 2.1. Methods of data collection
     - 2.1.1. source of data
     - 2.1.2. Types of data
   - 2.2. Methods of data presentation
     - 2.2.1. Introduction
     - 2.2.2. Frequency distributions: Qualitative, quantitative (absolute, relative, percentage, cumulative)
     - 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
3. **Measures of Central Tendency (4 lecture hour)**
   - 3.1 Introduction
   - 3.2 Objectives of measuring central tendency
   - 3.3 The summation notation
   - 3.4 Important characteristics of measures of central tendency
   - 3.5 Types of measures of central tendency
     - 3.5.1. The mean (Arithmetic, weighted, Geometric and Harmonic)
     - 3.5.2. The mode
     - 3.5.3. The Median
     - 3.5.4. The quantiles (quartiles, deciles, percentiles)
4. **Measures of Variation (4 lecture hour)**
   - 4.1 Introduction

4.2 Objectives of measuring variation

4.3 Absolute and relative measures

4.4 Types of measures of variation

4.4.1 The range and relative range

4.4.2 The variance, the standard deviation and the coefficient of variation

4.5 The standard scores

5. Elementary probability (4 lecture hour)

5.1 Introduction

5.2 Definition and some concepts (Random experiment, sample space, event, equally likely outcomes and mutually exclusive event)

5.3 Counting rules: addition, multiplication, permutation and combination rule

5.4 Approaches in probability definition (Classical and Axiomatic)

5.5 Some probability rules

5.6 Conditional probability and independence

6. Probability distributions (4 lecture hour)

6.1 Definition of random variables and probability distributions

6.2 Introduction to expectation: mean and variance of a random variable

6.3 Common discrete probability distributions: Binomial and Poisson

6.4 Common continuous probability distributions: normal

7. Sampling and sampling distribution of the sample mean (4 lecture hour)

7.1 Basic concepts: population, sample, parameter, statistic, sampling frame, sampling units

7.2 Reasons for sampling

7.3 Types of sampling techniques

7.3.1 Non-probability sampling: Basic concepts and definitions

7.3.2 Probability sampling: Basic concepts and definitions

7.4 Sampling distribution of the sample mean

7.5 The central limit theorem

8. One sample inference (4 lecture hour)

8.1 Introduction

8.2 Estimation

8.2.1 point estimation of population mean

8.2.2 Interval estimation of population mean

8.3 Hypothesis testing

8.3.1 Important concepts in testing statistical hypothesis

8.3.2 Hypothesis testing about population mean

8.3.3 Tests of association

9. Simple Linear Regressions and Correlation (4 lecture hour)

9.1 Introduction

9.2 Fitting simple linear regression

9.3 The covariance and the correlation coefficient

9.4 The rank correlation coefficient

Assessment methods

Assignment/quizzes	20 %
Mid semester examination	30%
Final examination	50%

Text books:

Bluman, A.G. (1995). Elementary Statistics: A Step by Step Approach (2nd edition).Wm. C. Brown Communications, Inc.

References:

1. Coolidge, F.L.(2006). Statistics: A Gentle Introduction (2nd edition).
2. David, S.M., McCabe, P. and Craig, B. (2008). Introduction to the Practice of Statistics (6th edition). W.H. Freeman
3. EshetuWencheko (2000). Introduction to Statistics. Addis Ababa University Press.
4. Freund, J.E and Simon, G.A. (1998). Modern Elementary Statistics (9th Edition).
5. Gupta, C.B. and Gupta, V. (2004). An Introduction to Statistical Methods. Vikas Publishing House, Pvt. Ltd, India.
6. Snedecor, G.W and Cochran, W.G. (1980). Statistical Methods (7th edition).
7. Spiegel, M.R. and Stephens, L.J. (2007). Schaum's Outline of Statistics, Schaum's Outline Series (4th edition). McGraw-Hill.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Linear Algebra				**Course Code:** MATH2011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	1
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

This course covers vectors; lines and planes; vector spaces; matrices; system of linear equations; determinants; eigenvalues and eigenvectors; linear transformations, orthogonality; matrix factorizations; canonical forms; direct sum decomposition of vector spaces; bilinear, quadratic and positive definite forms.

Course objectives

After taking this course, the student should be able to:

- understand the basic ideas of vector algebra,
- understand the concept of vector space over a field,
- understand the basic theory of matrix and its application,
- determine the eigenvalues and eigenvectors of a square matrix,
- grasp Gram-Schmidt process,
- find an orthogonal basis for a vector space,
- invert orthogonal matrix,
- understand the notion of a linear transformation,
- find the linear transformation with respect to two bases,
- Find eigenvalues and eigenvectors of an operator.

Course outline

1. **Characteristic equation (8 lecture hours)**
   1.1. Eigenvalues and eigenvectors

1.2. The characteristic polynomial

1.3. Similarity of matrices and characteristic polynomial

1.4. The special radius of a matrix

1.5. Diagonalization

1.6. Decomposable matrices

1.7. Minimal polynomial and Cayley-Hamilton theorem

2. Vectors and Vector Spaces (7 lecture hours)

2.1. Definition of points in n-space

2.2. Vectors in n-space; geometric interpretation in 2-and3-spaces

2.3. Applications on area and volume

2.4. Lines and planes

2.5. The axioms of a vector space

2.6. Examples of different models of a vector space

2.7. Subspaces, linear combinations and generators

2.8. Linear dependence and independence of vectors

2.9. Bases and dimension of a vector space

2.10. Direct sum and direct product of subspaces

3. **Linear Transformations (8 lecture hours)**

3.1. Linear transformations and examples

3.2. The rank and nullity of a definition of linear transformation and example

3.3. Algebra of linear transformations

3.4. Matrix representation of a linear transformation

3.5. Eigen values and eigenvectors of a linear transformation

3.6. Eigen space of a linear transformation

4. **Orthogonality (8 lecture hours)**

4.1 The inner product

4.2 Inner product spaces

4.3 Orthonormal sets

4.4 The Gram-Schmidt orthogonalization process

4.5 Cauchy-Schwartz and triangular inequalities

4.6 The dual space

4.7 Adjoint of linear operators

4.8 Self-adjoint linear operators

4.9 Isometry

4.10 Normal operators and the Spectral theorem

4.11 Factorization of a matrix (LU, Cholesky, QR)

4.12 Singular Value Decomposition

5. Canonical forms (6 lecture hours)

5.1 Elementary row and column operations on matrices

5.2 Equivalence of matrices of polynomials

5.3 Smith canonical forms and invariant factors

5.4 Similarity of matrices and invariant factors

5.5 The rational canonical forms

5.6 Elementary divisors

5.7 The normal and Jordan canonical forms

6. Bilinear and Quadratic Forms (6 lecture hours)

6.1 Bilinear forms and matrices

6.2 Alternating bilinear forms

6.3 Symmetric bilinear forms; quadratic forms

6.4 Real symmetric bilinear forms

7. Direct Sum Decomposition of Vector Spaces (6 lecture hours)

7.1 Definition of a direct sum of vector spaces

7.2 Projection and invariant subspaces of a linear operator

7.3 Primary decomposition theorem

Assessment methods

Assignment/quizzes	20 %
Mid semester examination	30%
Final examination	50%

Text books:

1. Demissu Gemeda, An Introduction to Linear Algebra
2. Schaum's Outline in Linear Algebra

References:

1. Hoffman and Kunze: Linear Algebra
2. Piage and swift: Linear Algebra
3. Beaumont: Linear Algebra
4. Halms: Finite Dimensional Vector space
5. Nomizu: Fundamentals of Linear Algebra
6. Anton H. and Rorres C. (2000). Elementary linear algebra: Application vision, 8th edn, John Wiley & Sons, Inc., Canada

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: Computer Science					
Course Title: Discrete Mathematics and Combinatorics				**Course Code:** Math 2052	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	1
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course description

This course deals with review of mathematics sets and functions, fundamental principles of counting, generating functions and recurrence relations, graph theory and its application.

Course objectives

On completion of the course, successful students will be able to:

- Know basic concept of logic and mathematical proof
- know basic concepts of discrete mathematics,
- understand the principles of counting, recurrence relations and generating functions,
- understand the basic concepts of graph and their types,
- know the basic algorithms on graphs,
- use the methods and principles of Combinatorics,
- apply Combinatorics in counting problems,
- solve simple counting problems,
- construct graphs with given degree patterns,
- apply graph theory to solve network-oriented problems.

Course outline

Chapter 1: Introduction to logic and mathematical proof (6hr)

- 1.1 Introduction to logic and statement
- 1.2 Propositional and predicate logic
- 1.3 Methods of proof
- 1.4 Elementary number properties

Chapter 2: Elementary counting principles (8 hrs)

- 2.1 Basic counting principle
- 2.2 Permutations and combinations
- 2.3 The inclusion-exclusion principles
- 2.4 The pigeonhole principle
- 2.5 The binomial theorem

Chapter 3: Elementary probability theory (7 hrs)

- 3.1 Sample space and events
- 3.2 Probability of an event
- 3.3 Conditional probability
- 3.4 Independent events
- 3.5 Random variables and expectation

Chapter 4: Recurrence relations (7 hrs)

- 4.1 Definition and examples
- 4.2 Linear recurrence relations with constant coefficient
- 4.3 Solutions of linear recurrence relations
- 4.4 Solutions of homogeneous and non - homogeneous recurrence relations

Chapter 5: Elements of graph theory (7 hrs)

- 5.1 Definition and examples of a graph
- 5.2 Matrix representation of a graph
- 5.3 Isomorphic graphs
- 5.4 Path and connectivity of a graph
- 5.5 Complete, regular and bipartite graphs
- 5.6 Eulerian and Hamiltonian graphs
- 5.7 Trees and forests (Rooted and Binary trees)
- 5.8 Planar graphs
- 5.9 Graph coloring

Chapter 6: Directed graphs (6 hrs)

- 6.1 Definition and examples of digraphs

6.2 Matrix representation of digraphs

6.3 Paths and connectivity

Chapter 7: Weighted graphs and their applications (7 hrs)

7.1 Weighted Graphs

7.2 Minimal Spanning trees

7.3 Shortest path problem

7.4 Critical Path Problem

Teaching- learning methods

Three contact hours of lectures and two hours of tutorials per week. Students do home assignments.

Assessment methods

Assignments/quizzes 20%

Mid semester examination 30%

Final examination 50%

Teaching materials

Text Books:

- Mattson, H. F. (1993). Discrete mathematics with applications. John Wiley & Sons, Inc.
- Roman, S. A. (1986). An introduction to Discrete mathematics. Saunders College Publishing.
- Rosen, K. H., & Krithivasan, K. (2012). Discrete mathematics and its applications: with combinatorics
- and graph theory. Tata McGraw-Hill Education.

References:

- Ensley, Douglas E.and J. WinstonCrawley,Discrete Mathematics: Mathematical Reasoning and Proof with Puzzles, Patterns, and Games, Wiley, 2005.
- Epp, S. S. (2010). Discrete mathematics with applications. Cengage learning.
- Harris, B. (1970). Graph Theory and its applications. Academic press.
- Iyengar, S.N. (2004). Discrete mathematics. Vikas publishing house PVT LTD.
- Lipschutz, S. (2016). Schaum's Outlines of Theory and Problems of Discrete Mathematics.
- Liu, C. L. (1986). Elements of discrete mathematics. Tata McGraw-Hill Education.
- Ore, O. (1974). Theory of graphs. American mathematical Society.
- Roman, S. (1986). An introduction to discrete mathematics. CBS College publishing.

DEBRE BERHAN UNIVERSITY **Institute of Technology**			**Computing College** **Department of Computer Science**		
Department: Computer Science					
Course Title: Digital Logic Design				**Course Code:** EENG2041	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	3	0
Course Prerequisite:	None				
Course Category:	Supportive				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

This course provides an overview of the principles underlying Number systems, arithmetic operations, decimal codes, alphanumeric codes, Boolean algebra, Karnaugh maps, implementation of digital logic gates using universal gates (NAND and NOR gates), exclusive-OR gates, integrated circuits, combinational circuits, decoders, encoders, multiplexers, Demultiplexers adders, subtractors, multipliers, sequential circuits, latches, flip-flops, sequential circuits analysis, and counters. Finally, under this course, Analysis and design of combinational and sequential logic systems will be done.

Course objectives

Upon the completion of the module, Students will be able to:

- Convert between decimal, binary, octal, and hexadecimal number systems.
- Differentiate different Codes in digital system.
- Perform two-level logic minimization using Boolean algebra and Karnaugh maps minimization method.
- Analyze the properties and realization of the various logic gates.
- Perform binary addition and subtraction.
- Implement the Boolean Functions using NAND and NOR gates.
- Incorporate medium scale integrated circuits, like decoders, encoders, multiplexers, etc., into circuit design.
- Differentiate and Design Combinational and Sequential circuits.
- Design and analyze clocked sequential circuits.
- Use various types of latches and flip-flops to build binary memory and counters.

- Perform asynchronous and synchronous sequential logic analysis

Course outline

1. **Introduction to Digital Systems (2 lecture hour)**
    - 1.1 Digital and analogue quantities
    - 1.2 Binary digit logic level and digital waveform
2. **Number system, operations and codes (2 lecture hour)**
    - 2.1 Decimal number
    - 2.2 Binary number
    - 2.3 Decimal to binary conversation
    - 2.4 1's and 2's compliment of binary number
    - 2.5 Signed number
    - 2.6 Hexadecimal number
    - 2.7 Octal number
    - 2.8 BCD
3. **Logic gates (2 lecture hour)**
    - 3.1 The inverter
    - 3.2 The AND gate
    - 3.3 The OR gate
    - 3.4 The NAND gate
    - 3.5 The NOR gate
    - 3.6 The Exclusive OR and Exclusive NOR gates
4. **Boolean algebra and Logic simplification (4 lecture hour)**
    - 4.1 Boolean operation and expression
    - 4.2 Laws and rules of Boolean algebra
    - 4.3 De Morgan Theorems
    - 4.4 Boolean analysis of logic circuit
    - 4.5 The K-map
5. **Combinational logic (6 lecture hour)**
    - 5.1 Functions of combinational logic
    - 5.2 Basic combinational logic circuits
    - 5.3 Implementing Combinational logic
    - 5.4 Universal property of NAND and NOR gates
    - 5.5 Adders, decoders, encoders, multiplexers and de multiplexers

6. **Flip flops (4 lecture hour)**
    - 6.1 Latches
    - 6.2 Edge triggered flip flops
    - 6.3 Master slave flip flops
    - 6.4 Applications
7. **Counters (4 lecture hour)**
    - 7.1 Synchronous counters
    - 7.2 Asynchronous counters
    - 7.3 Up/down counters
    - 7.4 Design of synchronous counters
8. **Shift registers (4 lecture hour)**
    - 8.1 Basic shift registers
    - 8.2 Serial in serial out registers
    - 8.3 Serial in parallel out Registers
9. **Memory and storage (4 lecture hour)**
    - 9.1 Basics of semiconductor Memory
    - 9.2 Random access memory (RAM's)
    - 9.3 Read only memory (ROM's)
    - 9.4 Programmable ROMs (PROM, EEPROM)
    - 9.5 Flash memories

Assessment Methods

Assignment/quizzes	10 %
Project	20%
Mid semester examination	20%
Final examination	50%

Text books and References:

1. Morris M. Mano: Digital Design (3rd Edition)
2. R. J. Tocci and N. S. Widmer: Digital Systems – Principles and Applications, 9th Ed, Prentice Hall, 2004
3. T.L. Floyd: Digital Fundamentals, 9th edition ,Prentice Hall
4. Stephen Brown, ZvonkoVranesic: Fundamentals of Digital Logic with Verilog Design, McGraw-Hill Science/Engineering/Math; 1st edition 2002
5. R.P. Jain: Modern Digital Electronics, raw-Hill Science/Engineering/Math; 1 edition, (August 21, 2006)
6. AnantAgarwal and Jeffrey Lang: Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Series, Jul 15, 2005

13.4. Common Courses

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Communicative English Language Skills I				**Course Code:** ELEn 1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				
Instructor's Contact Information:				**Course Delivery Information:**	
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____				Academic Year: _____ Year/Semester: I/I Meeting date: _____ Meeting time: _____ Meeting location: _____	

Course description:

Communicative English Skills is a course designed to enable students to communicate in English intelligibly with acceptable accuracy, fluency and ability to use English appropriately in different contexts. The course exposes students to English language learning activities designed to help students use English for their academic and social needs. Students would be engaged in language learning development activities through doing and reflection on action. This includes grammar and vocabulary as used in communicative events and all skills and their sub-kills: speaking, listening, reading and writing. The language and skills are integrated where one becomes a resource to the other. There are six units covering topics related to the life world of students as well as of societal relevance.

Course Objectives:

At the end of this course, students will be able to:

- Express themselves in social and academic events in English--Use English intelligibly with reasonable level of curacy and fluency
- Listen and comprehend to talks related to social and academic events given in English
- Read and understand texts written in English –texts on academic and social matters
- Write in English as academically and socially desirable.

- Learn and develop their English on their own—learning to learn: the language and Write clear reports and assignments in academic contexts, and the skills

Course Outline

1. Introducing Oneself

1.1. Listening

1.1.1. Introducing oneself (who you are, where you came from, where you finished your primary and secondary school), what you intend to study and why Vocabulary

1.2. Reading

1.2.1. Reading a short biography written in simple English: using background knowledge, reading with comprehension, making notes while reading, guessing meanings, attending to reference words & discussing notes,

2. Study Skills

2.1. Listening

2.1.1. listening to a talk on habits of successful students: reflecting on one's study skills, taking notes while listening, discussing notes, answering listening comprehension questions, discussing answers

2.1.2. Giving advice using tips from the listening text: using the language of giving advice

2.2. Reading

2.2.1. Reading an expository essay on study skills: reading with comprehension, attending to new vocabulary, writing notes while reading, writing brief summaries from notes

2.2.2. Studying the present perfect tense and the past perfect tense: form, use and meaning of conditionals

3. Sports and Health

3.1. Listening

3.1.1. Listening about Zinedine Zidan (who he is, his childhood, his professional career): using prior knowledge (talking about a famous football player), predicting what comes next and checking prediction, taking notes while listening, discussing notes, presenting oral summary), asking and answering Wh-questions

3.1.2. Studying conditionals (form, use and meaning)

3.2. Reading

3.2.1. Reading a short expository passage on sports and health: discussing how sports improve health, reading for main ideas, making notes while reading, developing notes into short summaries, comparing summaries

3.2.2. Working on vocabulary: using word formation

4. Cultural Values

4.1. Listening

4.1.1. Listening about cultural tourism: discussing how culture attracts tourists, listening with comprehension, taking notes while listening, discussing notes, developing notes into one-paragraph summaries

4.2. Reading

4.2.1. Reading an expository text on cultural values: reading with comprehension, writing notes while reading, answering comprehension questions, summarizing the text based on notes made while reading, discussing summaries

4.2.2. Revision simple present, simple past, present perfect and past perfect tenses: revising form, use and meanings of these tenses, writing short meaningful sentences using simple present, simple past, present perfect and past perfect forms of verbs

5. Tourism and Wildlife

5.1. Listening

5.1.1. Listening about human-wildlife conflict (argumentative text): using prior knowledge, listening with comprehension, making notes while reading, writing summaries using the notes, discussing the summaries

5.2. Reading

5.2.1. Reading a text on tourism and wildlife: using visual, reading with comprehension, guessing meanings of words based on context, writing brief notes while reading, discussing notes and developing them into summaries, discussing summaries

5.2.2. Working on denotative and connotative meanings

5.2.3. Revising conditionals: constructing meaningful sentences based on pictures

6. Population

6.1. Listening

6.1.1. Listening about population density: learning the meanings of ‘population’, ‘density’ and ‘population density’, predicting what comes in the talk and checking

prediction, listening with comprehension, taking notes while listening, discussing notes, writing short paragraphs using the notes and discussing them

6.2. Reading

6.2.1. Reading a text on population pyramid: interpreting tables, graphs and pie charts, reading with comprehension, making notes while reading, discussing notes, developing notes into paragraphs, discussing and improving paragraphs

6.2.2. Studying collocation: learning the definition of collocation, identifying words that collocate with 'population', doing exercise on collection, using collection in vocabulary study

6.2.3. Working on active and passive constructions (form, use, meaning): noticing grammar pattern in example sentences, listening to a brief lecture, writing lectures notes, discussing notes, identifying active and passive constructions, completing contextualized exercise, reading independently and compiling portfolio on passive constructions

Instructional Methods and Strategies: Providing brief introductory notes, Pair and group discussions, Presentation, independent reading, encouraging independent learning, giving individual and group works are some of the major teaching methods to be used**.**

Teacher's activities: Interactive lecture methods followed by discussion, demonstration, etc. and guide students in project work. And also permitting the students to voice and defend their own opinions and enhancing the students' commitment to individual study and acquiring knowledge are among the activities.

Students' activities: Active involvement of learners is required at each phase. This is done through questioning and answering, reflection, reporting, solving problems associated with the respective topics. The students individually and in peer practice and learn through project and practical work. Each practical will result in a report for assessment.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, Valuing Active Participation, Oral presentation, Valuing Attendance and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipment): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

1. Alfassi, M. 2004. Reading to learn: Effects of combined strategy instruction on high school students. *Journal of Educational Research*, 97(4):171- 184.
2. Anderson, N. 1999. *Exploring second language reading: Issues and strategies.* Toronto:Heinle&Heinle Publisher.
3. Bade, M. 2008. Grammar and good language learners.In C. Griffiths (Eds.). *Lessons from good language learners* (pp. 174-184). Cambridge University Press. *https//doi.org/10.107*/CBO9780511497667.016
4. Bouchard, M. 2005. *Reading comprehension strategies for English language learners: 30research-based reading strategies that help students read, understand and really learncontent from their textbooks and other nonfiction materials.* New York: Scholastic.
5. Cameron, L. 2001. *Teaching languages to young learners. Cambridge*: Cambridge University Press.
6. Chamot, A.U. 1987. The learning strategies of ESL students. *In A. Wenden & J. Rubin (Eds.). Learner strategies in language learning (PP 71-85).* Prentice-Hall: Hemel Hempstead.
7. Gairns, R. & Redman, S. 1986. Working with words: A guide to teaching and learning vocabulary. Cambridge University Press.
8. Department of Foreign Language and Literature. 1996. *College English (Volume I and Volume II)*. Addis Ababa University Press.
9. McNamara, D.S. (Ed.). 2007. *Reading comprehension strategies: Theories, interventions, andtechnologies*. New York: Erlbaum.
10. Tilfarlioğlu, Y. 2005. An Analysis of the relationshipbetweenthe use of grammar learning strategiesandstudent achievement at English preparatory classes.Journal of Language and Linguistic Studies 1: 155-169.
11. Murphy R. (?). *Essentials of English grammar in use: A self-study reference and practice book for intermediate students of English* (2nd Ed.). Cambridge University Press.
12. Murphy R. 2004. *English grammar in use: A self-study reference and practice book for intermediate students of English* (3rd Ed.). Cambridge University Press.
13. Zhang, L. J. 2008.Constructivist pedagogy in strategic reading instruction:Exploring pathways tolearnerdevelopment in the English as a second language (ESL) classroom. *Instructional Science, 36(2): 89-116*.https://doi.org/10.1007/s11251-007-9025-6.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: General Physics				**Course Code:** Phys 1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	2	1	2
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description:

This module will be taught in an introductory undergraduate level and is primarily designed for a broader audience of science students. The goal of the course is to give an overview of the various physics-based analysis and dating techniques used in science and technology. High school mathematics and physics concepts are enough as prerequisite for this course. Laws, principles, and methods of physics will be taught in a more descriptive manner using simple mathematics. The course covers preliminaries, mechanics, fluid mechanics, electromagnetism and electronics, thermodynamics, oscillations and waves, and cross-cutting applications of physics in different areas of science and technology.

Course Objectives:

Upon completion of this course students should be able to:

- Discuss basic physics by refreshing and summarizing the previous preparatory physics concepts before tackling the advanced physics courses.
- Explain the kinematics and dynamics of particles in one and two dimensions.
- State principles of fluids in equilibrium and solve problems applying Pascal's principle, Archimedes', principles and Bernoulli's equation in various situations.
- Explain the basic concepts of charges, fields and potentials.
- Analyze direct and alternating current circuits containing different electric elements and solve circuit problems.

- Demonstrate the use and the working system of cells (batteries), resistors, generators, motors and transformers.
- Explain the first law of thermodynamics for a closed system and apply it to solve problems.
- Discuss systems that oscillate with simple harmonic motion.
- Explain the application of physics in different sciences and technology fields.
- Apply and describe a variety of experimental techniques and grasp the general guidelines of laboratory.
- Develop the skill of laboratory work.

Course Outline:

1. Preliminaries

1.1. Physical Quantities and Measurement

1.1.1. Physical quantities

1.1.2. SI Units: Basic and Derived Units

1.1.3. Conversion of Units

1.2. Uncertainty in Measurement and Significant Digits

1.2.1. Significant digits

1.3. Vectors: composition and resolution

1.3.1. Vector Representation

1.3.2. Vector Addition

1.3.3. Components of Vector

1.4. Unit Vector

1.4.1. Vector addition in Unit Vector Notation

1.4.2. Finding a Unit Vector

2. Kinematics and Dynamics of Particles

2.1. Kinematics in One and Two Dimensions

2.1.1. Displacement, velocity and Acceleration in 1D and 2D

2.1.2. Motion with Constant Acceleration

2.1.3. Free Fall Motion

2.1.4. Projectile Motion

2.2. Particle Dynamics and Planetary Motion

2.2.1. The Concept of Force as A Measure of Interaction

2.2.2. Type of Forces

2.2.3. Newton's Laws of Motion and Applications

2.2.4. Uniform Circular Motion

2.2.5. Newton's Law of Universal Gravitation

2.2.6. Kepler's Laws, Satellites Motion and Weightlessness

2.3. Work, Energy and Linear Momentum

2.3.1. Work and Energy

2.3.2. Power

2.3.3. Linear Momentum

2.3.4. Collisions

2.3.5. Center of Mass

3. Fluid Mechanics

3.1. Properties of Bulk Matter

3.2. Density and Pressure in Static Fluids

3.3. Buoyant Force and Archimedes' Principles

3.3.1. Archimedes' principle

3.4. Moving Fluids and Bernoulli Equations (Fluid Dynamics)

3.4.1. Bernoulli's Equation

4. Heat and Thermodynamics

4.1. The concept of Temperature and the Zeroth law of Thermodynamics

4.2. Thermal Expansion

4.3. The Concept of Heat, Work and Internal Energy

4.4. Specific Heat and Latent Heat

4.5. Heat Transfer Mechanisms

4.6. The First Law of Thermodynamics

5. Oscillations, Waves and Optics

5.1. Simple Harmonic Motion

5.1.1. Periodic and Oscillatory Motion

5.1.2. Displacement, Velocity and Acceleration in a SHM

5.2. The simple Pendulum

5.3. Wave and Its Characteristics

5.4. Resonance

5.5. The Doppler Effect

5.6. Image Formation by Thin Lenses and Mirrors

6. Electromagnetism and Electronics

6.1. Coulomb's Law and Electric Fields

6.2. Electric Potential

6.3. Current, Resistance and Ohm's Law

6.4. Electrical Energy and Power

6.5. Equivalent Resistance and Kirchhoff's Rule

6.6. Magnetic Field and Magnetic Flux

6.7. Electromagnetic Induction

6.8. Insulators, Conductors and Semiconductors

6.9. Diodes

6.10. Transistors

7. Cross Cutting Applications of Physics

7.1. Physics in Agriculture and Environment

7.2. Physics in Industries

7.3. Physics in Health Sciences and Medical Imaging

7.4. Physics and Archeology

7.5. Application in Earth and Space Sciences

7.6. Applications in Power

Instructional Methods and Strategies:

Students' Activities: Students should read the module and/or reference materials and do the assignments on time. Practice with solved problems and come to office hours to get concepts clarified. Review and extra problems will be given through worksheets. Students are also expected to have worked through the problems in the worksheets before the tutorial sessions. Attendance at lectures and Laboratory is expected for all students. Attendance records will be taken at all times. It is the students chance to ask questions, solve problems and work in team.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipment):

LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

Recommended Laboratory Activities

For this course a total of 10 experiments relevant to Mechanics, Electricity and Magnetism, and Electronics will be carried out.

I. List of Experiments from Mechanics

- ✓ Measurements of basic constants, length, mass and time
- ✓ Free fall
- ✓ Hook's law
- ✓ Density of liquids
- ✓ Simple pendulum

II. List of Experiments from Electricity and Magnetism

- ✓ Calibration of voltmeter and ammeter from galvanometer
- ✓ Ohm's law, parallel and series combination of resistors

III. List of Experiments from electronics

- ✓ V-I characteristics of diode
- ✓ Rectification
- ✓ Logic gate

From these recommended experiments, at least six experiments to be performed. Simulation experiments from the Internet can be used to supplement laboratory activities whenever possible.

References

1. Serway, R. A. and Vuille, C., 2018, College Physics, 11th ed., Cengage Learning, Boston, USA
2. University Physics with Modern Physics by Young, freedman and Lewis Ford
3. Physics for Scientists and Engineers with Modern Physics by Douglas C. Giancoli
4. Fundamentals of physics by David Halliday, Robert Resnick and Gearl Walker
5. College Physics by Hugh D. Young Sears Zemansky, 9th edition.Herman Cember and Thomas A. Johnson, Introduction to Health Physics, 4th ed., (2008).
6. William R. Hendee and E. Russell Ritenour, Medical Imaging Physics, 4th ed., (2002).
7. Tayal D.C. Basic Electronics. 2nd ed. Himalaya Publishing House Mumbai, (1998).
8. Theraja B.L., R.S. Sedha. Principles of Electronic Devices and Circuits, S.Chand and Company Ltd, New Delhi, (2004).
9. Introduction to Space Physics, M. G. Kivelson and C. T. Russell, Cambridge University Press, 1995.
10. Stacey, Frank D.: Physics of the earth. 2nd Ed.,Wiley, 1977.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Critical Thinking				**Course Code:** LoCT 1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description:

The course, Logic and Critical Thinking, is a high-level thought course in the discipline of philosophy. It is a philosophical inquiry that takes argumentation and reasoning as its basic objects of investigation and attempts to introduce the fundamental concepts of logic and methods of logical argumentation and reasoning and critical thinking. It includes evaluation of the methods by which we form beliefs, weigh evidence, assess hypotheses and arguments, and analyze reasoning. Logic is concerned with the study of arguments, and it seeks to establish the conditions under which an argument may be considered as acceptable or good. It includes the development of standard methods and principles of arguments. Critical thinking is an exercise, a habit, a manner of perception and reasoning that has principles of logic as its fulcrum, and dynamically involves various reasoning skills that ought to be human approach to issues and events of life. Critical thinking means correct thinking in the pursuit of relevant and reliable knowledge about the world.

Course Objectives:

After the successful accomplishment of the course, students will able to:

- Understand the basic essence and areas of philosophy, and the necessity of learning it;
- Recognize the components and types of arguments;
- Develop the skill to construct and evaluate arguments;
- Understand the relationship between logic and language;

- Recognize the forms of meanings of words and terms;
- Comprehend the types, purposes and techniques of definitions;
- Understand the concept, principles, and criteria of critical thinking;
- Cultivate the habits of critical thinking and develop sensitivity to clear and accurate usage of language;
- Recognize the various forms of formal and informal fallacies; and
- Understand the components, attributes and representations of categorical propositions

Course Outline:

Chapter One: Introducing Philosophy

1.1. Chapter Overview
1.2. Meaning and Nature of Philosophy
1.3. Basic Features of Philosophy
1.4. Metaphysics and Epistemology
    1.4.1. Metaphysics
    1.4.2. Epistemology
1.5. Axiology and Logic
1.6. Logic
1.7. Importance of Learning Philosophy

Chapter Two: Basic Concepts of Logic

1.1. Chapter Overview
1.2. Basic Concepts of Logic: Arguments, Premises and Conclusions
1.3. Techniques of Recognizing Arguments
1.4. Types of Arguments: Deduction and Induction
1.5. Evaluating Arguments

Chapter Three: Logic and Language

1.1. Philosophy of Language: An overview
1.2. Logic and Meaning
1.3. Meaning, Types, and Purposes of Definitions
1.4. Techniques of Definition
1.5. Criteria for Lexical Definitions

Chapter Four: Basic Concepts of Critical Thinking

4.1. Meaning of Critical Thinking
4.2. Standards of Critical Thinking
4.3. Codes of Intellectual Conduct for Effective Discussion

4.4. Characteristics of Critical Thinking

4.5. Barriers to Critical Thinking

4.6. Benefits of Critical Thinking

Chapter Five: Informal Fallacies

5.1. Fallacy in General

5.2. Fallacies of Relevance

5.3. Fallacies of Weak Induction

5.4. Fallacies of Presumption

5.5. Fallacies of Ambiguity and Grammatical Analogy

Chapter Six: Categorical Propositions

6.1. General Introduction

6.2. Attributes of Categorical Propositions: Quality, Quantity, and Distribution

6.3. Venn Diagrams and the Modern Square of Opposition

6.4. Evaluating Immediate Inferences: Using Venn Diagrams and Square of Oppositions

Teaching-learning methods

Three hours of lectures and two hours of tutorials per week. Students do home assignments.

Assessment methods

- Assignments/quizzes 20%
- Mid semester examination 30%
- Final examination 50%

Teaching Materials:

Reference Books:

Copi, Irving M.and Carl Cohen, (1990) *Introduction to Logic*, New York: Macmillan Publishing Company.

Damer, Edward. (2005). *Attacking faulty reasoning. A practical guide to fallacy free argument.* Wadsworth Cengage learning, USA.

Fogelin, Robert, J, (1987) *Understanding Arguments: An Introduction to Informal Logic*, New York: Harcourt Brace Jvanovich Publisher.

Guttenplan, Samuel: (1991) *The Language of Logic*. Oxford: Blackwell Publishers

Simico, N.D and G.G James. (1983) *Elementary Logic*, Belmont, Ca: Wadsworth Publishing Company.

Stephen, C. (200) The Power of Logic. *London and Toronto*: Mayfield Publishing Company.

Walelign, Emuru, (2009) *Freshman Logic*, Addis Ababa.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Physical Fitness				**Course Code:** SpSc 1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	0	0	2	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

This course will provide the students with basic concepts of the five components of health related physical fitness (cardiovascular, muscular strength and endurance, flexibility, and body composition), conditioning, hypokinetic disease and general principles of training. It is mainly practical oriented. As a result, the students will be exposed to various exercise modalities, sport activities, minor and major games, and various training techniques as a means to enhance health related physical fitness components. In addition, they will develop the skills to assess each component of fitness and will practice designing cardiovascular, muscular strength and endurance, and flexibility programs based on the fitness assessment. The course serves as an introduction to the role of exercise in health promotion, fitness, performance including the acute and chronic responses of the body to exercise.

Course Objectives:

By the end of this course the students will be able to:

- Recognize the immediate and long-term responses of the body to various types of exercise.
- Understands the basic concepts of physical fitness and conditioning exercises.
- Understand the concept of hypokinetic disease and conditions.
- Distinguish the general principles of fitness training
- Develop conditioning programs to enhance the components of health related physical finesses.

- Participate in conditioning programs which may help to develop the components of health-related physical finesses.
- Understand health issues in relation to excess body fatness and excessively low body fat.
- Develop skills to assess health related physical fitness components.
- Develop healthy body weight management skill.
- Appreciate and value the benefits of regular physical exercise to healthy living.
- Develop interest to engage in a regular physical exercise program as a life time activity.
- Develop self-confidence and effective communication skills in and out of the school environment.

Course Outline

1. Concepts of physical fitness and conditioning

1.1. Meanings and definitions of terms

1.1.1. physical fitness

1.1.2. physical conditioning

1.1.3. Physical Activity,

1.1.4. Physical exercise and

1.1.5. Sport

1.2.General principles of fitness training

2. The Health Benefits of Physical Activity

2.1. Physical Activity and Hypokinetic Diseases/Conditions

2.2. Physical Activity and Cardiovascular Diseases

2.3. physical activity and postural deformity

3. Making Well-Informed Food Choices

3.1. Sound Eating Practices

3.2. Nutrition and Physical Performance

4. Health Related Components of Fitness

4.1. Cardiovascular fitness

4.1.1. Meaning and concepts of cardiovascular fitness

4.1.2. Means and methods of developing cardiovascular fitness

4.2. Muscle fitness

4.2.1. Meaning and concepts of muscle fitness

4.2.2. Means and methods of developing muscle fitness

4.3. Flexibility

4.3.1. Meaning and types of flexibility

4.3.2. Means and methods of developing flexibility

4.4. Body composition

4.4.1. Meaning of body composition

4.4.2. Health risks associated with over fatness

4.4.3. Health risks associated with excessively low body fatness

5. Assessment of Fitness Components

5.1. Assessment of cardiovascular fitness

5.2. Assessment of muscle fitness

5.3. Assessment of flexibility

5.4. Assessment of body composition

6. Development and Assessment of the Health Related Components of Fitness

Instructional Methods and Strategies: The course will involve deploying different teaching methods that attempt to make the teaching-learning process as effective as possible. the course delivery techniques will generally involve the following items: Lecture, Questioning and answering, Group discussions, Field Practice, Explanation and Demonstration

Teacher's activities: Provide maximum physical activity time within the class period, promote equal participation of all students in the course, Teach skills and activities that transfer in to lifetime physical activity, Motivate students to be active participants in the course and Praise for active participation

Students' activities: The success of this course and students learning experience is dependent on active engagement and participation of the students in all the spectrum of the course. Students are expected to come well prepared/dressed and constructively engage in class.

Class Discipline: "In each and every aspect of life, discipline comes first and worth a lot". This is what department of Sport Science reflects. As a result of this, any noise, chatting, chewing gum and the like are prohibited in every sessions of the course. In addition to these portable electronic media and communicative devices such as cell phones, pagers, MP3 players, I pods etc are not be used during the class for any reason. Thus, these devices should be switched off and kept out of sight.

Assessment Strategies and Techniques: At least 60% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 40% Final exam practical group assignment (peer training on the five components of fitness)

Instructional Resources (Materials and Equipments): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster, Sport field, and fitness equipments.

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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Geography of Ethiopia and the Horn				**Course Code:** GeES 1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description:

This course attempts to familiarize students with the basic geographic concepts particularly in relation to Ethiopia and the Horn of Africa. It is also intended to provide students a sense of place and time (geographic literacy) that are pivotal in producing knowledgeable and competent citizens that are able to comprehend and analyze problems and contribute to their solutions. The course consists of four parts. The first part provides a brief description on the location, shape and size of Ethiopia as well as basic skills of reading maps. Part two introduces the physical background and natural resource endowment of Ethiopia and the Horn which includes its geology and mineral resources, topography, climate, drainage and water resources, soil, fauna and flora. The third part of the course focuses on the demographic characteristics of the country and its implications on economic development. The fourth component of the course offers treatment of the various economic activities of Ethiopia and the Horn which include agriculture, manufacturing and service sectors. Moreover, Ethiopia in a globalizing world is treated in the perspectives of the pros and cons of globalization on its natural resources, population and socio economic conditions.

Course objectives:

At the end of this course, students will be able to:

- Acquire basic knowledge on the geographic attributes of Ethiopia and Horn
- Develop a sense of appreciation and tolerance of cultural diversities and their interactions

- Acquire general understanding of physical geographic processes, and human-environment relationships
- Develop ethical aptitudes and dispositions necessary to live in harmony with the natural environment
- Develop an understanding of national population distributional patterns and dynamics
- Conceptualize the comparative advantages of economic regimes; and understand the impacts of globalization.
- Understand their country's overall geographic conditions and opportunities; and be proud of the natural endowments and cultural richdom that help them develop a sense of being an Ethiopian.

Course Outline:

1. Introduction

1.1. Geography: Definition, scope, themes and approaches

1.2. Location, Shape and Size of Ethiopia and the Horn

1.2.1. Location and its effects

1.2.2. The shape of Ethiopia and its implication

1.2.3. The size of Ethiopia and its implications

1.3. Basic Skills of Map Reading

2. The Geology of Ethiopia and the Horn

2.1. Introduction

2.2. The Geologic Processes: Endogenic and Exogenic Forces

2.3. The Geological Time scale and Age Dating Techniques

2.4. Geological Processes and the Resulting Landforms

2.4.1. The Precambrian Era geologic processes and resultant features

2.4.2. The Paleozoic Era geologic processes and resultant features

2.4.3. The Mesozoic Era geologic processes and resultant features

2.4.4. The Cenozoic Era geologic processes and resultant features

2.5. Rock and Mineral Resources of Ethiopia

3. The Topography of Ethiopia and the Horn

3.1. Introduction

3.2. Physiographic Divisions

3.2.1. The Western Highlands and Lowlands

3.2.2. The Southeastern Highlands and Lowlands

3.2.3. The Rift Valley

3.3. The Impacts of Relief on Biophysical and Socioeconomic Conditions

4. Drainage Systems and Water Resources of Ethiopia and the Horn

4.1. Introduction

4.2. Major Drainage Systems of Ethiopia

4.3. Water Resources: Rivers, Lakes, and Subsurface Water

4.4. General Characteristics of Ethiopian Rivers

4.5. Water Resources Potentials and Development in Ethiopia

5. The Climate of Ethiopia and the Horn

5.1. Introduction

5.2. Elements and Controls of Weather and Climate

5.3. Spatiotemporal Patterns and Distribution of Temperature and Rainfall in Ethiopia

5.4. Agro-ecological Zones of Ethiopia

5.5. Climate and its Implications on Biophysical and Socioeconomic Aspects

5.6. Climate Change/Global Warming: Causes, Consequences and Response Mechanisms

6. Soils, Natural Vegetation and Wildlife Resources of Ethiopia and the Horn

6.1. Introduction

6.2. Ethiopian Soils: Types, Degradation and Conservation

6.3. Types and Distribution of Natural Vegetation in Ethiopia

6.4. Natural vegetation: Uses, Degradation and Conservation Strategies

6.5. Wildlife Resources of Ethiopia: Types, Importance, and Conservation Strategies

7. Population of Ethiopia and the Horn

7.1. Introduction

7.2. Population Data: Uses and Sources

7.3. Population Dynamics: Fertility, Mortality and Migration

7.4. Population Distribution and Composition

7.5. Sociocultural Aspects of Ethiopian Population: Education, Health and Languages

7.6. Settlement Types and Patterns

8. Economic Activities in Ethiopia

8.1. Introduction

8.2. Mining**,** Fishing and Forestr**y**

8.3. Agriculture in Ethiopian

8.3.1. Contributions, potentials and characteristics of agriculture in Ethiopia

8.3.2. Agricultural systems in Ethiopia

8.3.3. Major problems of Ethiopian agriculture

8.4. Manufacturing in Ethiopia

8.4.1. Manufacturing: essence and contributions

8.4.2. Types, characteristics and distribution of manufacturing

8.4.3. Industrial development in Ethiopia: Challenges and Prospects

8.5. The Service Sector in Ethiopia

8.5.1. Transportation and communication in Ethiopia: types, roles and characteristics

8.5.2. Trade in Ethiopia: types, contributions and characteristics

8.5.3. Tourism in Ethiopia: Types, major tourist attraction sites, challenges and prospects

Instructional Methods and Strategies: Gap Lecture, Peer/ group Discussion and Reflection, Reading Assignment, etc. are some of the major teaching methods to be used**.**

Teacher's activities: Interactive lecture methods followed by discussion, demonstration, etc. and guide students in project work. And also permitting the students to voice and defend their own opinions and enhancing the students' commitment to individual study and acquiring knowledge are among the activities.

Students' activities: Active involvement of learners is required at each phase. This is done through questioning and answering, reflection, reporting, solving problems associated with the respective topics. The students individually and in peer practice and learn through project and practical work. Each practical will result in a report for assessment.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipment): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Communicative English Language Skills II				**Course Code:** ELEn 1012	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	Communicative English Language Skills (FLEn 1011)				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

A Writing Proficiency course is one in which the development of writing skills is an integral part of the course objectives. These/This courses/course provide/provides students with opportunities to develop basic writing skills and learn the process of writing as practiced by a particular academic discipline or profession. The course predominantly focuses on academic writing, presentation, reports, and appraisal of academic discourses. The course intends to introduce students to the basic functions of English in the areas stated below: note taking from lectures, identifying structure of lectures, identifying focuses of lectures, discriminating major and minor ideas in lectures, distinguishing lecturers' opinions from academic facts, writing reports, writing summaries and reviews in academic writing, showing probability and certainty in academic reports, describing and reporting visuals such as tables, graphs etc

Course Objectives

At the end of this course, students will be able to:

- Identify the structure and emphasis of academic lectures,
- Distinguish the different meaning levels in academic texts,
- Interpret visuals like tables, charts, graphs etc. in academic texts,
- Conduct oral presentations in academic contexts with confidence,
- Debate logically about different issues with their friends,
- Express their ideas effectively in various communicative contexts,

- Master skills of persuasive arguments
- Describe visuals in paragraphs,
- Write clear reports and assignments in academic contexts, and
- Summarize, review and critique academic texts.

Course Outline

1. **Indigenous Knowledge**
    - 1.1. Speaking
        - 1.1.1. Discussing on the term 'Indigenous Knowledge'
    - 1.2. Listening
        - 1.2.1. Predicting and checking the prediction
    - 1.3. Vocabulary
        - 1.3.1. Dealing with words that collocate
    - 1.4. Reading
        - 1.4.1. Finding out inferences and references
    - 1.5. Writing
        - 1.5.1. Writing for or against "Indigenous Knowledge"
    - 1.6. Grammar
        - 1.6.1. Using appropriate tenses for planning and reporting
2. **Environmental Protection**
    - 1.7. Listening
        - 1.7.1. Listening text
        - 1.7.2. Discourse markers showing contrast and addition
    - 1.8. Reading
        - 1.8.1. An article on measures to protect the environment
        - 1.8.2. Gap-fill exercises for verbs formed form adjectives and the adjectives themselves
        - 1.8.3. Comprehension questions
    - 1.9. Speaking
        - 1.9.1. Words and phrases for expressing cause and effect
        - 1.9.2. Conditional sentence type
        - 1.9.3. Future tense
        - 1.9.4. Simple present

1.9.5. Expressions of hopes and fears, agreeing and disagreeing

1.10. Writing

1.10.1. A five-paragraph essay

1.10.2. An article to be summarized

3. Digital Technology

1.11. Listening

1.11.1. A TED Talk on the dangers of digital technology

1.12. Reading

1.12.1. Magazine article

1.13. Speaking

1.13.1. Phrases for asking for and giving reasons.

1.13.2. Comparative and superlative forms

1.13.3. 'Wh' questions

1.13.4. Modals

1.14. Writing

1.14.1. Questionnaire for a survey

1.14.2. A 2-3 pages long report on the results of a questionnaire

1.14.3. Oral presentations of the results of the survey

1.14.4. Sample survey report for analysis

2. **Lifelong Learning**

2.1. Speaking and listening

2.2. Listening

2.3. Vocabulary

2.4. Grammar

2.5. Reading

2.6. Writing

4. Wonders of the World

11.1 Listening

2.6.1. Listening text describing a wonder of the world

11.2 Reading

11.2.1 A story about national heritage that the government of Ethiopia is campaigning for its recognition by UNESCO

11.2.2 An article that contains the history of world heritage sites registered by UNESCO

11.2.3 A table containing nouns, verbs and adverbs used to describe statistical information

11.3 Speaking

11.3.1 Expressions for suggestions or recommendations, agreement and disagreement

11.3.2 Language of descriptions

11.3.3 A sample descriptive essay

11.4 Writing

11.4.1 Gap-fill exercise on prepositions

11.4.2 Sample descriptive essay

12 Mindset

12.1 Listening

12.2 Reading

12.3 Speaking

12.4 Writing

Instructional Methods and Strategies: Providing brief introductory notes, Pair and group discussions, facilitating interactive work, encouraging independent learning, giving individual and group works are some of the major teaching methods to be used**.**

Teacher's activities: Interactive lecture methods followed by discussion, demonstration, etc. and guide students in project work. And also permitting the students to voice and defend their own opinions and enhancing the students' commitment to individual study and acquiring knowledge are among the activities.

Students' activities: Active involvement of learners is required at each phase. This is done through questioning and answering, reflection, reporting, solving problems associated with the respective topics. The students individually and in peer practice and learn through project and practical work. Each practical will result in a report for assessment.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work, Valuing Active Participation, Valuing Attendance and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipment): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Social Anthropology				**Course Code:** Anth 1012	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	3	2	2	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description:

This course is designed to introduce the anthropology of Ethiopian societies and cultures to first year students of Higher Learning Institutions (HLIs). It covers basic concepts of anthropology such as culture, society and humanity. It also discusses themes including unity and diversity; kinship, marriage and family; indigenous knowledge systems and local governance, identity, multiculturalism, conflict, conflict resolution and peacemaking system; intra and inter-ethnic relations of Ethiopian peoples. In addition, the course explores culture areas of Ethiopia such as plough culture, *enset* culture and pastoralism. The course further covers marginalized minority and vulnerable groups in terms of age, gender, occupation and ethnicity by taking ethnographic case studies into account and discuss ways of inclusive growth.

Course objectives:

Up on the successful completion of the course, students will be able to:

- Develop an understanding of the nature of anthropology and its broader scope in making sense of humanity in a global perspective;
- Understand the cultural and biological diversity of humanity and unity in diversity across the world and in Ethiopia;
- Analyze the problems of ethnocentrism against the backdrop of cultural relativism;
- Realize the socially constructed nature of identities & social categories such as gender, ethnicity, race and sexuality;

- Explore the various peoples and cultures of Ethiopia;
- Understand the social, cultural, political, religious& economic life of different ethnolinguistic & cultural groups of Ethiopia;
- Understand different forms marginalization and develop skills inclusiveness;
- Appreciate the customary systems of governance and conflict resolution institutions of the various peoples of Ethiopia;
- Know about values, norms and cultural practices that maintain society together;
- Recognize the culture area of peoples of Ethiopia and the forms of interaction developed over time among themselves; and
- Develop broader views and skills to deal with people from a wide variety of socioeconomic and cultural backgrounds.

Course Outline

1. Introducing Anthropology and Its Subjects

1.1. What is anthropology – a Mirror for Humanity?

1.1.1. Sketching the subject matter, scope and concerns of anthropology

1.1.2. Anthropological imagination: asking questions and seeing the world anthropologically.

1.1.3. Defining Features of Anthropology- holism, relativism & comparative perspectives

1.1.4. Methods of Research in anthropology: ethnography & ethnographic methods

1.2. Sub-fields of Anthropology: Four Mirrors for Understanding Humanity

1.3. The relation between anthropology and other disciplines

2. Human Culture and Ties that Connect

2.1. Conceptualizing Culture: What Culture Is and What Culture Isn't?

2.2. Characteristics features of culture: what differentiates culture from other traditions?

2.3. Aspects of Culture –Material & Non-material (values, beliefs & norms)

2.4. Levels of culture: universality, generality and particularity (cultural diversity)

2.5. Ethnocentrism, Cultural relativism, and human rights

2.5.1. Discussion- Debating cultural relativism: Human rights law and the demonization of culture and anthropology along the way

2.5.2. Cultural Change: what is cultural change?

2.5.3. Cultural Diffusion versus Cultural Assimilation

2.5.4. Innovation

2.5.5. Discussion - Contesting culture as sharply bounded versus unbounded 'cultural flows' or as 'fields of discourse' in the context of globalization.

2.6. Ties that Connect: Marriage, Family and Kinship

2.6.1. Marriage -rules, functions and forms of Marriage

2.6.2. Family -types and functions of Family

2.6.2.1. Q. How families and marriage differ in different societies?

2.6.3. Kinship System -types of kin groups and rules of descent

2.6.4. Kinship and Gender Across Cultures

2.6.4.1. Sex and Gender: Mapping differences in cross cultural perspective

2.6.4.2. Gender –as power relations

2.7. Cultural practices, norms and values that maintain society together

3. Human Diversity, Culture Areas, and Contact in Ethiopia

3.1. Human Beings & Being Human: What it is to be human? –(a bio-cultural animal?)

3.2. Origin of the Modern Human Species: Homo sapiens sapiens (that's you!)

3.2.1. Religious, biological & evolutionary (paleo-anthropological) explanations

3.3. The Kinds of Humanity: human physical variation

3.3.1. Q. Why isn't everyone the same?

3.3.2. Q. Why do people worldwide have differences in their phenotypic attributes?

3.4. Human Races: the history of racial typing

3.4.1. The Grand Illusion: Race, turns out, is arbitrary

3.4.2. Q. What can we say for sure about human races?

3.5. Why is Everyone Different? Human Cultural Diversity - anthropological explanations

3.5.1. Q. Why don't others do things the way we/I do?

3.6. Culture areas and cultural contacts in Ethiopia

3.6.1. Plough culture area

3.6.2. Enset culture area

3.6.3. Pastoral societies culture area

3.6.4. Historical and social interactions between culture areas

4. Marginalized, Minorities, and Vulnerable Groups

4.1. Gender based marginalization

4.2. Occupational cast groups

4.3. Age based vulnerability (children and old age issues)

4.4. Religious and ethnic minorities

4.5. Human right approaches and inclusive growth, anthropological perspectives

5. Theories of Inter-Ethnic Relations and Multiculturalism in Ethiopia

5.1. The Scales of Human Identity: Who am I? - Understanding 'self' & 'other'

5.1.1. Q- What are the ways we tell for others who we are?

5.2. Ethnicity and Race: What's in a name?

5.3. Ethnic Groups & Ethnic Identity

5.3.1. Q. What is the basis of one's ethnic identity?

5.3.2. Q. Is ethnicity a fundamental aspect of human nature & self-consciousness, essentially unchanging and unchangeable identity? Or

5.3.3. Q. Is it, to whatever extent, socially constructed, strategically or tactically manipulable, and capable of change at both the individual and collective levels?

5.4. Race –the social construction of racial identity

5.4.1. Q. Do the claims of some people/groups about superior & inferior racial groups have any scientific validity?

5.5. Primordialism; Instrumentalism; Social constructivism

5.6. Debates on inter-ethnic relations and identities

6. Customary and Local Governance Systems and Peace Making

6.1. Indigenous knowledge systems and local governance

6.2. Intra and inter-ethnic conflict resolution institutions Ethnographic cases: commonalities and shared practices (e.g., Oromo and Somali, Afar and Tigray; Gedeo and Oromo; Guraghe and Siltie; Amara and Tigray)

6.3. Customary/Local governance systems Ethnographic cases: Oromo Geda; Somali-Gurti; Gamo, Gofa, Wolayita-Woga; Guraghe-Sera

6.4. Legal pluralism: interrelations between customary, religious and state legal systems

Instructional Methods and Strategies: This course will be delivered based on learner centered approach. Therefore, the main instructional strategies of the course are pair & group discussions; interactive teaching; brainstorming; icebreaker; debating & role-play.

Teacher's activities: An instructor of this course is expected to be honest to the content, policies and guidelines of this course. He/she is also expected to be well prepared on the course

as well as prepare course outlines & teaching materials, follow up and assess students as per the guidelines.

Students' activities: Students are expected to attend regularly. If students miss more than 20% of the classes, he/she will not sit for final exam. Punctuality is mandatory and late coming student should not be allowed to enter the class.

Assessment Strategies and Techniques: Based on the progressive understandings of the course, students will be evaluated continuously through both non-graded assignments / activities, like (reading assignments) and graded assignments/activities and assessments including class discussion & participation, Test, Term Paper & presentation, Home Taken Exam/case studies and Final Exam. At least 50% continuous assessments (quizzes, tests, assignments, and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipments): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Moral and Civic Education				**Course Code:** MCiE1012	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	3	2	2	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____ Office: _____ Phone: _____ Email: _____ Office Hours: _____	Academic Year: _____ Year/Semester: I/II Meeting date: _____ Meeting time: _____ Meeting location: _____

Course Description:

The Ethiopian government has designed and implemented moral and civic education curricula to aim at educating students about democratic culture, ethical values and principles, supremacy of constitution, and the rule of law and so on. These elements are imperative in the process of producing self-confident citizens and a generation who has the capability to shoulder responsibility. Accordingly, this module is basically aspires to equip the learners with relevant knowledge, respect for the worth and human dignity of every individual, right attitudes and requisite skills to enable them perform their roles as a credible members of their society. Through the module, learners will also acquire nature of Ethiopian federalism and parliamentary system of government, ways of making responsible decisions, solve problems, care about others, contribute to society, and be tolerant and respectful of diversity.

Course Objectives

After the successful completion of this module students will be able to:

- Conceptualize what morality, ethics and civics mean.
- Comprehend the goals of civics and ethics as well as the competences of a good citizen.
- Discuss the relations between society, state and government.
- Differentiate federal state structure from unitary and discuss the advantages and disadvantages of the state structures.
- Discuss the processes of modern Ethiopian state formation and nation building.

- Comprehend the features of Ethiopian federalism.
- Conceptualize constitution, its classification and unique features.
- Define the term human rights, the unique features and its classifications.
- Differentiate the teleological, deontological and virtue theories.

Course Outline:

1. **Understanding Civics and Ethics**
   - 1.1. Chapter introduction
   - 1.2. Defining Civics, Ethics and Morality
   - 1.3. Ethics and Law
   - 1.4. The importance/goal of moral and civic education
2. **Approaches to Ethics**
   - 2.1. Chapter introduction
   - 2.2. Normative ethics
   - 2.3. Non-normative ethics
3. **Ethical Decision Making and Moral Judgements**
   - 3.1. Chapter introduction
   - 3.2. How can we make ethical decisions and actions?
   - 3.3. To whom or what does morality apply?
   - 3.4. Who is morally/ethically responsible?
   - 3.5. Why should human beings be moral?
4. **State, Government and Citizenship**
   - 4.1. Chapter introduction
   - 4.2. Understanding state
   - 4.3. Rival theories of state
   - 4.4. The role of the state
   - 4.5. Understanding government
   - 4.6. Understanding citizenship
5. **Constitution, Democracy and Human Rights**
   - 5.1. Chapter introduction
   - 5.2. Constitution and constitutionalism
   - 5.3. Constitutionalism
   - 5.4. The constitutional experience of Ethiopia: Pre and post 1931.

5.5. Democracy and democratization

5.6. Human Rights: concepts and theories

Instructional method and strategies

Teacher's activities: Introducing objectives to the students, asking brain storming questions, Defining terms and concepts in global affairs, brief introduction to the sub topics, Giving class room and home based works, Checking, evaluating, and giving feedback to students' work and Summarizing the chapters

Students' activities: Active involvement of learners is required at each phase. This is done through questioning and answering, brainstorming, reflection, reporting, solving problems associated to the respective topics.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipments): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

1. Bunbongkarn, S., 2001. The role of civil society in democratic consolidation in Asia. Center for International Exchange, p.230.
2. Camara, M. S. (2008). Media, civil Society and political culture in West Africa, African Journalism Studies, 29(2), 210-229.
3. Dorsen, N., Rosenfeld, M., Sajó, A., & Baer, S. (2003). Comparative constitutionalism: cases and materials.
4. Gashaw, A. (2015) Constitution, constitutionalism and foundation of democracy in Ethiopia.
5. Getahun, K. (2007). Mechanisms of Constitutional Control: A preliminary observation of the Ethiopian system. Afrika Focus, 20(1-2).

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Economics				**Course Code:** ECON 2013	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description:

This course provides a general introduction to economics combining elements of micro and macro fundamentals. The first part of the course focuses on partial equilibrium aspects of theories of consumer behaviour, producer behaviour as well as on the arrangements and implications of different market structures. It will also cover the neoclassical theory of product and/or service pricing for perfectly competitive, monopolistic, oligopoly, and monopoly market structures. In addition, topics covered will include factor market pricing, general equilibrium analysis and distortions which relate to asymmetric information and moral hazard problems. The second part will discuss elements of macroeconomics that revolve around issues of measurement of aggregate economic activities, unemployment, and inflation. Emphasis will also be given to sources, consequences and policy responses to economic fluctuations. In the first part the course commences by highlighting the underlying assumptions behind each theory followed by in-depth analyses of the decisions of economic units subject to resource constraints in an effort to realize their respective objectives assuming the prevalence of market clearing situation. Finally, students will be able to contextualize the key analytical instruments with stylized facts from the Ethiopian economy.

Course Objectives

After completing introduction to economics, students will be able to:

- Describe the major economic units constituting a given society and their corresponding roles
- Explain the objective functions of consumers and how they attain this objective under resource constraints
- Define producers' objective functions, describe their cost structures in the short and the long run, and apply partial equilibrium approaches to find optimal prices and quantities under different degrees of competition.
- Tabulate markets into different categories on the basis of the number of buyers and sellers and outline the various social welfare implications of each market structure.
- Elaborate the concept of general equilibrium analysis, identify its merits and demerits, and discuss the various market failures due to distortions arising from imperfect information and cultivate the corresponding possible remedial measures
- Understand how aggregate economic measures are constructed, their weaknesses, and alternative measures of national wellbeing
- Identify the sources and adverse effects of economic crises and describe the pool of policy instruments that can be deployed to mitigate the consequences of these crises.
- Contextualize the key analytical instruments with stylized facts from the Ethiopian economy

Course outline

1. Theory of Consumer Behavior and Demand

1.1. consumer preferences and choices

1.1.1. Consumer preference

1.1.2. Utility

1.2. Approaches to measuring utility

1.2.1. The cardinal utility approach

1.2.2. Assumptions of cardinal utility theory

1.2.3. Total and marginal utility

1.2.4. Law of diminishing marginal utility (LDMU)

1.2.5. Equilibrium of a consumer

1.2.6. Derivation of the cardinalist demand

1.3. The ordinal utility approach

1.3.1. Assumptions of ordinal utility approach

1.3.2. Indifference set, curve and map

1.3.3. Properties of indifference curves

1.3.4. The marginal rate of substitution (MRS)

1.3.5. Types of indifference curves

1.4. The budget line or the price line

1.4.1. Factors affecting the budget line

1.4.1.1. Effects of changes in income

1.4.1.2. Effects of changes in price

1.5. Optimum of the consumer

1.5.1. Effects of changes in income and prices on consumer optimum

1.5.1.1.Changes in income: income consumption curve and the Engel curve

1.5.1.2.Changes in price: price consumption curve (PCC)

1.5.2. Decomposition of income and substitution effects (normal, inferior or giffen goods)

1.5.3. Derivation of market demand curve

1.6. Elasticity of demand

2. The Theory of Production

2.1. Production function

2.2. Stages and laws of production

2.3. The law of variable proportions

2.4. Laws of returns to scale

2.5. Choice of optimal combination of factors of production

2.6. Short run and long run production functions

3. Theory of Costs.

3.1. Definition and types of costs

3.2. Short-run costs

3.3. Long-run costs

3.4. Derivation of cost functions from production functions

3.5. Dynamic changes in costs- the learning curve

4. Perfect Competition Market

4.1. The concept of market in physical and digital space (e.g. Amazon, Alibaba,etc..)

4.2. The welfare costs, benefits of e-markets and their implication for regulatory mechanisms

4.3. Competitive markets, short- run equilibrium of the firm, industry, and market

4.4. The long-run equilibrium of the firm, industry and market

5. Pure Monopoly Market

5.1. Characteristics and source of monopoly

5.2. Short run and long-run equilibrium

5.3. Price discrimination

5.4. Multi-plant monopolist

5.5. Social cost of monopoly power

6. Monopolistic Competition

6.1. Assumptions

6.2. Product differentiation, the demand curve and cost of the firm

6.3. The concept of industry and product 'group'

6.4. Short-run and long-run equilibrium of the firm excess capacity and welfare loss

6.5. Brief introduction to oligopoly markets

7. Fundamentals of Macroeconomics

7.1. The concepts of GDP and GNP

7.2. Approaches of measuring national income (GDP/GNP)

7.3. Other social accounts (GNP, NNP, NI, PI and DI)

7.4. Nominal versus real GDP

7.5. The GDP deflator and the consumer price index

7.6. GDP and welfare

7.7. The business cycle

7.8. Unemployment and inflation

7.9. Technology (. e.g. Robots) and unemployment

7.10. Role of exchange rate, terms of trade, and other external shocks

7.11. Brief introduction to the Ethiopian Economy

Instructional Methods and Strategies: The course will involve deploying different teaching methods that attempt to make the teaching-learning process as effective as possible. For most part of the course, delivery method will be arranged as to make the process student-centered. There shall be full and active participation from students and they are strongly encouraged to ask questions, to reflect on brain-storming queries, and be involved actively and attentively in take-home assignments and peer discussions that appear during the semester both within and outside class-room sessions. While there is no limit to the imagination and flexibility of the instructor, the course delivery techniques will generally involve the following items: Lecture, Brain-storming sessions, Group discussions and Individual and group assignments

Students' Activities: **Preparedness**: You must come to class prepared by bringing with you the appropriate materials like handouts, worksheets and exercises given, text books and completed assignments. Complete the individual and group assignments and other activities on time. You must plan your own learning through reading various course related materials and chapters in books. You are expected to work much individually to meet the requirement of the course. You have to use your time for group work and home study effectively.

Participation: Make active participation during discussions (you must participate in class). You are not participating if you are simply talking to a friend, doing homework, daydreaming, or not doing what the rest of the class is doing. If you are working in a group or with a partner, you must talk to your group members or partner and be a part of the group. Always be ready and willing to give constructive feedback to partners'/group members and to listen to their comments on your work

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipments): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

1. Koutsoyiannis, Modern Microeconomics
2. D.N.Dwivedi, 1997, Micro Economic Theory, 3rd Ed., Vikas Publishing
3. R.S. Pindyck& D.L. Rubinfeld,Microeconomics.
4. Hal R. Varian, Intermediate Microeconomics: A Modern Approach, 6th Ed.
5. C.L.Cole, Micro Economics: A Contemporary Approach.
6. Ferguson & Gould's, 1989, Microeconomic Theory, 6th Ed.
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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Global Trends				**Course Code:** GLTr1012	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	4	2	2	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

The course is designed to equip students with the basics of international relations so that they will be exposed to global challenges and perspectives. The course is very comprehensive, broad and multidisciplinary in its nature. Perhaps you may find it as an ice-breaking course since it touches up on wide range of issues, concepts, theories, approaches and debates that are helpful in understanding the contemporary international relations. Concepts, such as national interest, foreign policy, actors, globalization, balance of power, cold war, multi-polar systems, international law and other relevant concepts are being introduced. Different debates and approaches to the study of international relations including realism, liberalism are also given due emphasis.

Course Objectives

After completing this course, students will be able to:

- Understand nations, nationalism and states
- Explain the nature and historical development of international relations
- Examine the extent and degree of influence of state and non-state actors in the international system
- Gain basic knowledge of the major theories of International Relations and develop the ability to critically evaluate and apply such theories
- Elucidate national interest, foreign policy and diplomacy

- Assess the overriding foreign policy guidelines of Ethiopia in the past and present
- Explicate the nature and elements of international political economy
- Examine the roles major international and regional institutions play in world politics
- Explore Ethiopia's role in regional, continental and global institutions and affairs
- Critically evaluate the major contemporary global issues

Course Outline

1. Understanding International Relations

1.1. Conceptualizing Nationalism, Nations and States

1.2. Understanding international relations

1.3. The nature and evolution of international relations

1.4. Actors in international relations

1.5. Levels of analysis in international relations

1.6. The structure of international relations

1.7. Theories of international relations

2. **Understanding Foreign Policy and Diplomacy**

2.1. Defining national interests

2.2. Understanding foreign policy and foreign policy behaviors

2.3. Overview of foreign policy of Ethiopia

3. **International Political Economy (IPE)**

3.1. Meaning and nature of international political economy (IPE)

3.2. Theoretical perspectives of IPE

3.3. Survey of the most influential national political economy systems in the world

3.4. Core issues, governing institutions and governance of international political economy

3.5. Exchange rates and the exchange rate system

4. **Globalization and Regionalism**

4.1. Defining globalization

4.2. The globalization debates

4.3. Globalization and its impacts on Africa

4.4. Ethiopia in a globalized world

4.5. Pros and Cons of globalization

4.6. Defining regionalism and regional integration

4.7. Major theories of regional integration

4.8. Selected cases of regional integration

4.9. Regionalization versus globalization and states

4.10. The relations between regionalization and globalization

4.11. Regionalization, globalization and the state

5. **Major Contemporary Global Issues**

5.1. Survey of major contemporary global issues

Instructional method and strategies: Introducing objectives to the students, asking brain storming questions, Defining terms and concepts in global affairs, brief introduction to the sub topics, Giving class room and home based works, Checking, evaluating, and giving feedback to students' work and Summarizing the chapters

Students' activities: Active involvement of learners is required at each phase. This is done through questioning and answering, brainstorming, reflection, reporting, solving problems associated to the respective topics.

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipments): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References

1. Balaam, David N., and Bradford Dillman. 2011. *Introduction to International Political Economy*. Boston: Longman.
2. Bates, R. (1982). Markets and States in Tropical Africa. Berkeley: University of California Press.
3. Baylis, J. and Steve S. 2001. The Globalization of World Politics: *An Introduction to International Relations.* Oxford University Press: New York.
4. Booth, K. and Smith, S. (eds), International Relations Theory Today (Cambridge: Polity)
5. Brown, Chris, Understanding International Relations (London, Macmillan, 1977)

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Entrepreneurship & Business Development				**Course Code:** MGMT3102	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: III/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course description

This interdisciplinary course is designed to introduce students to meaning and the concept of entrepreneurship vs entrepreneur, creativity and innovation and their manageable processes that can be applied across careers and work settings. It focuses on building entrepreneurial attitudes and behaviors that will lead to creative solution within community and organizational environments. Course topics include the history of entrepreneurship, the role of entrepreneurs in the 21st century global economy, and the identification of entrepreneurial opportunities. The elements of creative problem solving, the development of a business ideas, products and services, marketing and developing new ventures, the examination of feasibility studies and the social and moral implications of entrepreneurship will be incorporated. Besides, issues related to starting and financing a new venture are included. Finally, managing growth and through merger, acquisitions, licensing, outsourcing, franchising etc. And forms of business organizations, legal and regulatory frameworks of governing the whole system are also encompassed in the course syllabus.

Course objectives:

After completing the course learners will be able to understand:

- Meaning of the term entrepreneurship within the context of society; organizations and individuals.
- The role of entrepreneurship on the economy.
- Developing a concept for an innovative idea, product or service in one's own area of

interest.

- How to develop elements of the entrepreneurial mindset and discuss the implications for functioning as a successful entrepreneur.
- The way how to prepare business plan as roadmap.
- The basic concepts of risk, its type & classification
- How to develop market and new venture
- How to explore alternative sources of financing the new venture
- How to form business organizations and consider practical ethical issues during the process

Course Outline

1. Overview of Entrepreneurship

1.1. What is entrepreneurship?

1.2. Definition and philosophy of entrepreneurship vs entrepreneur

1.3. Historical origin of entrepreneurship

1.4. Role within the economy

1.5. Entrepreneurship, creativity and innovation

2. Business Development

2.1. Definition and importance

2.2. Economic, social & political aspects of business enterprises

2.3. Business Failure factors.

2.4. Problems of small-scale businesses in Ethiopia

2.5. Setting up small scale businesses

2.5.1. Basic business ideas

2.5.2. the ways of organizing business ideas that an entrepreneur should have

2.5.3. Definition of industry and small-scale industry

2.5.4. Steps in setting up a small-scale business

3. Business Planning

3.1. The concept of business planning

3.2. Feasibility planning

3.3. The business plan

3.4. Developing a business plan

4. **Conception of Idea, Product or Services**
    - 4.1. Idea, Product or Service Technology
    - 4.2. Idea, product or service development process
    - 4.3. Idea, product or service protection
        - 4.3.1. Patents
        - 4.3.2. Trademarks
        - 4.3.3. Copyrighting
5. **Marketing and new venture development**
    - 5.1. What is market?
    - 5.2. Marketing research
    - 5.3. Marketing intelligence
    - 5.4. Competitive analysis
    - 5.5. Marketing strategies
    - 5.6. International markets
6. **Organizing and financing the new venture**
    - 6.1. Entrepreneurial team and business formation
    - 6.2. Sources of financing
        - 6.2.1. Asset management
        - 6.2.2. Equity Financing
        - 6.2.3. Venture Capital
        - 6.2.4. Debt financing
        - 6.2.5. Government financing e.g. Omo, Dev't Bank etc…
        - 6.2.6. NGO financing e.g. Germany supports for disabilities interest free loan disbursement
7. **Managing Growth and Transaction**
    - 7.1. Preparing for the launch of the venture
    - 7.2. Managing early growth of venture
    - 7.3. New venture expansion strategies and Issues (Mergers, Acquisitions, licensing and Franchising)
    - 7.4. Legal and regulatory frameworks of growth & transaction of new venture

Instructional Methods and Strategies: The course will involve deploying different teaching methods that attempt to make the teaching-learning process as effective as possible. For most part of the course, delivery method will be arranged as to make the process student-centered. There shall be full and active participation from students and they are strongly encouraged to ask questions, to reflect on brain-storming queries, and be involved actively and attentively in take-home assignments and peer discussions that appear during the semester both within and outside class-room sessions. While there is no limit to the imagination and flexibility of the instructor, the course delivery techniques will generally involve the following items: Lecture, Brain-storming sessions, Group discussions and Individual and group assignments

Students' Activities: Preparedness: You must come to class prepared by bringing with you the appropriate materials like handouts, worksheets and exercises given, text books and completed assignments. Complete the individual and group assignments and other activities on time. You must plan your own learning through reading various course related materials and chapters in books. You are expected to work much individually to meet the requirement of the course. You have to use your time for group work and home study effectively.

Participation: Make active participation during discussions (you must participate in class). You are not participating if you are simply talking to a friend, doing homework, daydreaming, or not doing what the rest of the class is doing. If you are working in a group or with a partner, you must talk to your group members or partner and be a part of the group. Always be ready and willing to give constructive feedback to partners'/group members and to listen to their comments on your work

Assessment Strategies and Techniques: At least 50% continuous assessments (quizzes, tests, assignments, project work and/or mid-examination) and 50% final examination

Instructional Resources (Materials and Equipment): LCD, computer (desktop or laptop), course outlines, markers, flip charts, white board, chalk board, duster.

References:

1. Hailay Gebretinsae, Entrepreneurship and Small Business Management, 2nd Edition.
2. Hodgetts, Richard M.Kurakto, DonaldF. "Entrepreneurship: A contemporary approach ". Fourth Edition, the Dryden Press, 1998.
3. Hirsh Robert D. D. and Peters Michael P. "Entrepreneurship" Fifth Edition, Tata McGraw Hill Edition, 2002.
4. Holt David H. "Entrepreneurship – New venture Creation "Eastern Economy Edition, 2000.
5. Donald F. Kutatko and Richard M. Hodgetts, "Entrepreneurship: A Cotemporary Approach Fourth Edition.

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Introduction to emerging technologies				**Course Code:** EmTe1012	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	2
Course Prerequisite:	None				
Course Category:	Compulsory				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/II
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course Description

This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality 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.

Objective of the course

Up on the completion of this course students will be able to:

- Identify different emerging technologies
- Differentiate different emerging technologies
- Select appropriate technology and tools for a given task
- Identify necessary inputs for application of emerging technologies

Syllabus Components

Course Contents, Methods & strategies, and learning outcomes

Time	Content & sub-contents	Methods & Strategies	Students Task	Learning Outcomes: At the end of this chapter students will be able to
Week 1-2	Chapter 1: Introduction to Emerging Technologies 1.1 Evolution of Technologies 1.1.1 Introduction to Industrial revolution (IR) 1.1.2 Historical Background (IR 1.0, IR 2.0, IR 3.0) 1.1.3 Fourth Industrial Revolution (IR 4.0) 1.2 Role of Data for Emerging Technologies 1.3 Enabling devices and network (Programmable devices) 1.4 Human to Machine Interaction 1.5 Future Trends in Emerging Technologies	• Listening • Note-taking • Brainstorming • Reading • Individual work • Group discussion • Reflections • Gapped Lecture	• Attend the lesson • Listen and take notes • Answer questions • Read • Doing class works and home works, • Reflects	• Develop knowledge of IR • Identifies programmable device • Develop the knowledge how computer interact with machine • Develop general knowledge about emerging technologies
Week 3 - 4	Chapter 2: Introduction to Data Science 2.1. Overview for Data Science 2.1.1. Definition of data and information 2.1.2. Data types and representation 2.2. Data Value Chain 2.2.1. Data Acquisition 2.2.2. Data Analysis 2.2.3. Data Curating 2.2.4. Data Storage 2.2.5. Data Usage 2.3. Basic concepts of Big data	• Listening • Note-taking • Brainstorming • Gapped Lecture • Group discussion • Class work • Tutorials	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	• Develop the Knowledge of data science • Identify the various data value chain • Know how about Big data

Week 5 – 7	Chapter 3: Artificial Intelligence (AI) 3.1. Introduction to AI 3.1.1. What is AI 3.1.2. History of AI 3.1.3. Levels of AI 3.1.4. Types of AI 3.2. Applications of AI 3.2.1. Agriculture 3.2.2. Health 3.2.3. Business (Emerging market) 3.2.4. Education 3.3. AI tools and platforms (e.g.: scratch/object tracking) 3.4. Sample application with hands on activity (simulation based)	• Listening • Note-taking • Brainstorming • Gapped Lecture • Group discussion • Class work • Tutorials • Reflections	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	• Develop the knowledge of AI • Know how where to use AI
Week 8 – 10	Chapter 4: Internet of Things (IoT) 4.1. Overview of IoT 4.1.1. What is IoT? 4.1.2. History of IoT 4.1.3. Advantage of IoT 4.2. How IoT Works 4.2.1. Architecture of IoT 4.2.2. Device and Network .3. IOT tools and platforms (e.g.: KAA IoT /Device Hive/Zetta/Things Board…) 4.4. Sample application with hands on activity (e.g. IOT based smart farming)	• Listening • Note-taking • Brainstorming • Reading • Individual work • Group discussion • Reflections • Gapped Lecture	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	• Develop the general knowledge of IOT. • know how IoT works and where to Put on

Week 11-12	Chapter 5: Augmented Reality(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	• Listening • Note-taking • Brainstorming • Reading • Individual work • Group discussion • Reflections • Gapped Lecture	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	•Develop the knowledge of AR •Identify and differentiate about VR, AR and MR •Develop the knowledge of AR architecture and its Application area.
Week 13	Chapter 6: Ethics and professionalism of emerging technologies 6.1. Technology and ethics 6.2. Digital privacy 6.3. Accountability and trust 6.4. Treats and challenges	• Listening • Note-taking • Brainstorming • Reading • Individual work • Group discussion • Reflections • Gapped Lecture	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	• Develop general knowledge on ethics and professionalism of emerging technologies
Week 14 – 15	Chapter 7: Other Emerging Technologies 7.1. Nanotechnology 7.2. Biotechnology 7.3. Blockchain technology 7.4. Cloud and quantum computing 7.5. Autonomic computing 7.6. Computer vision 7.7. Embed systems 7.8. Cyber security 7.9. Additive manufacturing (3D Printing) Etc. …	• Listening • Note-taking • Brainstorming • Reading • Individual work • Group discussion • Reflections • Gapped Lecture	• Attend the lesson • Listen and take short notes, • Asking and answering questions, • Doing class works and home works, • Participating in group discussions. • Reflects	• Know how about currently available emerging technologies

DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: General Psychology				**Course Code:** Psyc1011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	5	3	3	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: I/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

Course description

This introductory course will provide students with an overview of the current body of knowledge and the science of psychology. This course examines the role of environmental factors and the interaction of nature and nurture in determining behaviors and mental processes. Areas to be discussed will include; the essence psychology, human development, theories of learning, memory and forgetting, motivation and emotion, psychological disorder and treatments. The course will also focus on how to develop life skills based on the theories and principles of psychology where self-development, academic and social skills shall be given due attention.

Course Rationale

The course General Psychology and Life skills encompasses the fundamental concepts and principles of psychology which have immense application to human life problems. Hence, this course is intended to introduce students to the basic concepts of psychology and acquaint them with how to apply psychological knowledge, principles, and theories to real life situation and problems. So it is of paramount importance for students of any field of study to be effective in their personal, social, and professional life. Apart from that, it is to introduce students to the core set of life skills, which are important in realizing holistic development of students (i.e sense of

well-being, confidence and academic performance) so that they can lead happy, healthy, successful, and productive life.

Learning outcomes

Up on the completion of this course, students will be able to:

- Describe basic psychological concepts.
- Compare and contrast the major theoretical perspectives in psychology.
- Discuss different aspects of human development
- Compare and contrast different learning theories
- Summarize motivational and emotional processes
- Demonstrate social and interpersonal skills in everyday life.
- Set an adaptive goal and plan for future.
- Apply knowledge of psychology to one's own life & to develop life skills.
- Explain ways how self-confidence, self-esteem, self-efficacy, assertiveness, responsible behaviors, interpersonal skills will be strengthened.
- Apply different stress coping mechanisms.

Week	Contents	Assessment Techniques
Week 1	**Chapter One: Essence of Psychology**	
	1.1. Definition of Basic Concepts	
	1.2. Goals of Psychology	
	1.3. Historical Background of Psychology	
	1.4. Theoretical Perspectives in Psychology	
	1.5. Branches of Psychology	
	1.6. Research Methods in Psychology	
	1.7. Applications of Psychology	
Week 2 & 3	**Chapter Two: Human Development**	
	2.1.Definition and Concepts of Human Development	
	2.2. Facts and Principles of Human Development	
	2.3. Aspects of Human Development	
	2.4. Theories of Human Development	
	2.4.1. Cognitive Theories	
	2.4.2. Psychosexual Theory	
	2.4.3. Psychosocial Theory	
	2.4.4. Moral Development Theory	

	2.5. Personality Development	
	2.5.1. Meaning of Personality	
	2.5.2. Trait theories of Personality	
	2.5.3. Humanistic theories of Personality	
Week 4 & 5	**Chapter Three: Learning and Theories of Learning**	
	3.1 Definition, Principles and Characteristics of Learning	
	3.2 Factors Influencing Learning	
	3.3 Theories of Learning and their Applications	
	3.3.1. Behavioral Theory of Learning	
	3.3.2. Social Learning Theory	
	3.3.3. Cognitive Learning Theory	
Week 6	**Chapter Four: Memory and Forgetting**	
	4.1. Memory	
	4.1.1. Meaning and Process Of Memory	
	4.1.2. Stages of Memory	
	4.1.3. Factors Affecting Memory	
	4.2. Forgetting	
	4.2.1. Meaning and Concepts of Forgetting	
	4.2.2.Theories of Forgetting	
	4.3. Improving Memory	
Week 7 & 8	**Chapter Five: Motivation and Emotion**	
	5.1. Motivation	
	5.1.1. Definition and Types of Motivation	
	5.1.2. Theories of Motivation and their Applications	
	5.1.3. Conflict of Motives and Frustration	
	5.2. Emotion	
	5.2.1. Definition of Emotion	
	5.2.2. Components of Emotion	
	5.2.3. Theories of Emotion and their Applications	
Week 9	**Chapter Six: Psychological Disorders and Treatment Techniques**	
	6.1. Nature of Psychological Disorders	
	6.2. Causes of Psychological Disorders	
	6.3. Types of Psychological Disorders	
	6.4. Treatment Techniques	
Week 10	**Chapter Seven: Introduction to Life Skills**	
	7.1. Nature and Definition of Life skills	

	7.2. Goals of Life Skills	
	7.3. Components of Life Skills	
Week 10-12	**Chapter Eight: Intra-personal and Personal Skills**	
	8.1. Self-Concept and Self-Awareness	
	8.2. Self-Esteem and Self-Confidence	
	8.3. Self-Control	
	8.4. Emotional Intelligence and Managing Emotion	
	8.6. Resilience and Coping with Stress	
	8.7. Anger Management	
	8.8. Critical and Creative Thinking	
	8.9. Problem Solving and Decision Making	
Week 13	**Chapter Nine: Academic Skills**	
	9.1. Time Management	
	9.2. Note-taking and Study Skills	
	9.3. Test-Taking Skill	
	9.4. Test Anxiety and Overcoming Test Anxiety	
	9.5. Goal Setting	
	9.6. Career Development Skill	
Week 14 & 15	**Chapter Ten: Social Skills**	
	10.1. Understanding Intercultural Diversity and Diversity Management	
	10.2. Gender and Social Inclusion	
	10.3. Interpersonal Communication Skills	
	10.4. Social Influences and Peer Pressure	
	10.5. Assertiveness	
	10.6. Conflict and Conflict Resolution	
	10.6. Team Work	
	10.7. Overcoming Risky Behavior	
	Week 16 is Reserved For Final Examination	

Teaching Learning Methods

Classroom lessons will be mainly lectures preceded by activities (leading questions followed by brainstorming) and pair or group discussions followed by presentations with amendments by the instructor. Students will be given cases in light of the theories covered and asked to analyze cases form the perspectives of the course objectives and make presentations. At the start of every lesson, students will be requested to give brief summaries of the previous lesson. At the end of each unit, they will be requested to prepare exit slips where they reflect on what they have learned and what aspects of the unit need further consideration. In this way continuous

assessment of students' understanding will be held and remedial actions taken. Whatever so, below is listed some general approaches:

- Gapped Lecturing
- Brainstorming
- Collaborative learning
- Discussion
- Independent learning
- Reading assignment and presentation
- Role play

Assessment & Evaluation Techniques

1. Continuous Assessment 50 %
    - Test: 20 %
    - Group assignment- 10 %
    - Individual assignment- 10 %
    - GroupPresentation-10 %
2. Final exam 50%

Course Policy

Responsibilities of the Students:

All students are expected to abide by the code of conduct of students as per the Legislation of the respective university throughout the course. Academic dishonesty, including cheating, being late, fabrication and plagiarism will not be tolerated and will be reported to the concerned bodies for disciplinary action. Regular attendances, class activities (questions), doing assignments and submitting them on time are indispensable vehicles for the successful accomplishment of the course. Moreover, mobile cell phones are to be switched off so as to avoid distractions in the teaching learning activities including examination time. Lastly, but not least, note that all issues discussed in the class will be incorporated in quiz, tests or final exams.

Responsibilities of the Instructor

- Planning learning activities needed for the successful accomplishment and realization of the course objectives
- Running classes according to the official instructional schedule for successful coverage of the designed course contents within the planned instructional time
- Regularly planning assessment activities and designing relevant (reliable, valid, and

usable) assessment tools to realize the objectives of continuous assessment

- Providing timely and constructive feedbacks on students' performance on every assessment activities
- Being good role model for the students in the issues like punctuality, objectivity, honesty, transparency, fairness, humbleness, tolerance, devotion to one's duty, mercy, dressing/neatness etc.

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DEBRE BERHAN UNIVERSITY **Institute of Technology**				**Computing College** **Department of Computer Science**	
Department: Computer Science					
Course Title: Inclusiveness				**Course Code:** SINE2011	
Course Load:	ECTS	Credit	Lecture hrs.	Laboratory hrs.	Tutorial hrs.
	4	2	2	0	0
Course Prerequisite:	None				
Course Category:	Common Course				

Instructor's Contact Information:	**Course Delivery Information:**
Name: _____	Academic Year: _____
Office: _____	Year/Semester: II/I
Phone: _____	Meeting date: _____
Email: _____	Meeting time: _____
Office Hours: _____	Meeting location: _____

1. Introduction

Development efforts of any organization need to include and benefit people with disabilities through providing education, creating employability, promoting prosperity, reducing poverty and enhancing stability. Unfortunately, this has not been the practice for the majority of people with disabilities due to unfavorable attitude, negligence and exclusion from all development endeavors. It is obvious that people with disabilities are the large stand most disadvantaged minority in the world. They are about 15 percent of the global population (about one billion people), and 17.6 million in Ethiopia, with most extended families including someone with a disability (World Health Organization and World Bank and 2011). Exclusion practices of this large number of persons with disabilities in Ethiopia seem undermines their potential/ability to contribute to poverty reduction and economic growth within their household, their community and the country. It is clear that it is not impairment, but, the exclusion practices that has contributed for poverty aggravation for persons with disabilities. Exclusion practices of persons with disabilities have a long history, affecting the life of people with disabilities and the society at large. In the past and even today people have been discriminated due to their disabilities.

Inclusions promote effective developments through full participation of all members of a population and people with disabilities, where both are agents of development and beneficiaries. Through identifying and removing barriers, people with disabilities participate

and benefit from the developments. Genuine inclusion of people with disabilities allow them actively participate in development processes and eliminate dependence syndrome, leads to broader benefits for families and communities, reduces the impacts of poverty, and positively contributes to a country's economic growth. All stages of development processes of any organization should be inclusive through creating equal access to education, health care services, work and employment, social protection and all development center of human being.

2. Course Description

Special needs education refers to people with divers' disabilities, gifted and talented, and divers' population being at risk of education and development. As per the institutional reform that is focusing on enhancing development for all population, the field of inclusive education is taking center stage in institutional planning and improvement. This course introduces the process of achieving inclusion with all appropriate accessibility and established support system at institutional level.

In this course, the higher education students will learn how to assess, understand and address the needs of persons with disabilities and provide relevant support or seek extra support form experts. He/she also learns how to adapt and implementing services for an inclusive environment that aimed to develop holistic development such as affective, cognitive and psychosocial skills of the population with disabilities. Identification and removal/management of environmental barriers would find a crucial place in the course. The students learn how to give more attention and support for students with; hearing impairments, visual impairment, deaf-Blind, autism, physical and health impairments, intellectually challenged, emotional and behavior disorders, learning difficulty, communication disorders, gifted and talented student, and those at risk due to different reason (population who are environmentally and culturally deprived, abused, torched, abandoned, and orphaned and vulnerable..etc.). All University students will be given the chance to study the specific developmental characteristics of each group of students with disabilities and come up with appropriate intervention strategies in inclusive settings of their respective professional environment and any development settings where all citizens are equally benefited.

3. Learning outcome of the course

The goal of this course is to provide the tools and strategies that help to create a convenient environment that accommodates population with divers' disabilities and potential. This course encourages exploring the benefits of collaborating with colleagues to design and implement inclusion an all sphere of life. It also guides the discovery of ways to modify environment as well as services and practices to meet the needs of all persons with disabilities in inclusive environment.

As a result of reviewing various reading materials, completing the assignments, engaging in related discussions, and strongly workings on activities, towards the completion of the course, the University students of all fields in Ethiopia will be able to:

1. Aware the needs of people with special needs, their potential and include all aspects of developmental needs
2. Identify population with special needs, their potentials and the learning and working styles of all population with special needs in their environment.
3. Demonstrate desirable attitude towards all population with special needs in their learning, working and living environment
4. Apply various assessment strategies for evidence-based planning to meet their needs
5. Attempt to adapt environments they are working and living in according to the need and potential of the population with special needs
6. Develop an accommodative and inclusive attitude help to think for the wellbeing and development of population with special needs.
7. Identify and select appropriate support and services method that addresses the life needs of population with special needs individually and on group bases.
8. Collaborate with experts and relevant others for the life success of all persons with disabilities in all environments.
9. Create and maintain successful inclusive environment

4. **Detailed Syllabus components**

Unit 1. Understanding students with diverse needs/special needs

Time allotted: 10 contact hours

Unit objectives

At the end of completing this unit, the students will be able to:

1. Brief historical trends of special needs population and their holistic development
2. Describe the effect of negative attitude on educational and life success of people with special needs
3. Describe the nature of difficulties, preventable causes, identification, and assessment, of students with various impairments that affect their daily learning.
4. Identify students with special needs whose daily life and functioning is challenged and those students who are at risk.
5. Describe the need and characteristics of gifted and talented population
6. Depict the condition of student at risk because of different reasons (environmentally, culturally and linguistically deprived, abused, torched, abandoned, and orphaned and vulnerable student) who need special attention in educational setting.

Unit Contents and sub contents

7. Overview of students with various special needs; sensory, physical, below average intelligence, emotional and behavioral challenges, learning difficulties, communication difficulties, gifted and talented, students at risk, their developmental characteristics and preventable causes.

8. Theoretical models such as the right model, medical model and social model of special needs and its relevance.

9. Educational of students with various special needs.

10. Attitudinal barriers and means to enhance awareness among the community members and political leaders.

11. The relationship between Poverty and Disability

12. Planning effective development of population with special needs in inclusive settings

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate

13. Interactive lectures
14. Collaborative learning
15. Independent/self-learning
16. Institutional/school visits and practicum
17. Individual and group assignments and presentation
18. Seminars
19. Expert consultancy
20. Group participation
21. Guest practitioners
22. Others…

Detailed activities

Students' Activities

2. Reading the materials delineated for this purpose
3. Discus and/or report the diversities of learners in the classroom and report
4. Conduct mini case studies of students with divers needs
5. Visit schools that integrate students with special needs and report the teaching and learning experience at school.
6. Find out gifted and talented students and gather facts on the teaching and learning experience at school.
7. Find out evidence the effective instructional approach from existing experience and literature.

Instructors Activities

1. Facilitate students learning by posing questions and guiding their activities
2. Provide some examples of students with special needs and their success.
3. Provide group case study questions
4. Support learners in all aspects in relation to their learning

5. Facilitate dialogue among learners to find out effective instructional approach that address divers learning needs.

Assessment Strategies and Techniques

23. Recording attendance
24. Recording group and individual participation
25. Visit reports and presentation
26. Assignment (individual and group)
27. Test at the end of the unit

Unit 2. Understanding Inclusion

Time allotted: 8 hours

Unit Objectives

Upon accomplishing this unit, the teacher candidates will be able to perform the following activities.

1. Organize and implement inclusion for people with varying special needs
2. Demonstrate understanding of the principles of an inclusive environment, the rationale for inclusion, and its effect on education, and development.
3. Define terms associated with inclusion and its practices
4. Recognize what an inclusive environment looks and sounds like
5. Respect rights of students with special needs along with the disability convention ratified by the Ethiopian Government
6. Identify the benefits and challenges of inclusion
7. Modify environment to meaningfully accommodate population with special needs in all environments

Unit Contents and sub contents

8. Definition of inclusive environment and the support system
9. Elements of Inclusive environment
10. Characteristics of inclusive environment
11. Special needs population’s right in the inclusive environment
12. Benefits and Challenges of Inclusion

13. Strategies in addressing individual needs.
14. Policies, legislations, strategies, legal framework and other related documents.

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

15. Interactive lectures
16. Group task
17. Collaborative/cooperative learning
18. Independent/self-learning
19. Institutional visits and practicum
20. Individual and group assignments and presentation
21. Seminars
22. Expert consultancy
23. other…

Detailed activities

Students' Activities

1. Discuss; define what inclusive environment and the support system for population with divers needs
2. Discus and list elements and characteristics of inclusive enviroment
3. List special populations' right to development and discuss how to implement Inclusive environment
4. Explore the benefits and challenges of inclusion, individually and in-group

Instructors Activities

5. Facilitate students learning by posing questions and guiding their activities
6. Create participatory learning classroom.
7. Provide activity guide for the students
8. Encourage all students to work on the activities in cooperative manner
9. Provide special support for those with difficulties or special needs
10. Provide feedback on the students' various activities

11. Stabilize the learning by summarizing core points
12. Demonstrate the importance and application of adapted technology
13. Introduce Web sites devoted to technology use in the inclusive classroom.
14. Introduce software and multimedia applications.

Assessment Strategies and Techniques

24. Recording attendance
25. Recording group and individual participation
26. Recording the product of students
27. Test at the end of the unit
28. Assignment and visit reports

Unit 3: Identification of population with special needs

Time allotted: 5 hours

Unit objectives

Upon completing this unit, the students will be able to:

1. Learn and engage in developing identification tools that would be applicable in the environment
2. Identify different needs among population with special needs and use various strategies that support their developmental needs. Demonstrate the process of identifying students who need special support and the options available for serving these students' educational needs

Unit Contents and sub contents

3. Development of checklists for identification of various difficulties.
4. Procedure of identification
5. Identifying learners needs, potentials and difficulties in learning

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

6. Interactive lectures
7. Group activities.
8. Collaborative learning

9. Independent/self-learning
10. Institutional/school visits and practicum
11. Individual and group assignments and presentation
12. Seminars
13. Expert consultancy
14. Others…

Detailed activities

Students' Activities

1. Read materials on how to identifying learning styles of learns, from literature and experiences.
2. Discuss how to identify various support strategies
3. Discus on various instruments on how to identify students need, potentials and difficulties
4. Develop identification checklist for specific difficulty.

Instructors Activities

5. Facilitate students learning by posing questions and guiding their activities
6. Provide activity guide for the students
7. Encourage all students to work on the activities in cooperative manner
8. Provide special support for those with who need it
9. Provide feedback on the students' various activities

Assessment Strategies and Techniques

15. Recording attendance
16. Recording group and individual participation
17. Recording the product f students
18. Test at the end of the unit
19. Assignment
20. Portfolio

Unit 4. Assessment in special needs

Time allotted: 5 hours

Unit objectives

At the end of this unit, the students will be able to:

1. Adapt assessments for students with special needs
2. Understand potential challenges of using standard assessment tools to measure the progress of students with special needs
3. Modify and create assessments that accurately evaluate the skills and progress of all students, including those with special needs
4. Use ongoing as well as summative assessments
5. Use portfolios to assess ethically and appropriately what each student knows and able to do in inclusive classroom.
6. Design an assessment that addresses an equity issue
7. Assess, design and decide the most appropriate educational programming for student/youth with sensory impairments, physical and health impairments, intellectually challenged, emotional and behavior disorders, learning difficulty, communication disorders, and students at risk and gifted and talented students.
8. Assess and design on elimination of social and environmental barriers that would facilitate inclusive education

Unit Contents and sub contents

9. Strategy and procedure to develop assessment instrument.
10. Relevant components of assessment instrument.
11. Progressive assessments
12. Portfolios
13. Implication of assessment

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

14. Assignment
15. Group and individual presentations
16. Collaborative learning

17. Independent/self-learning
18. Institutional/school visits and practicum
19. Individual and group assignments and presentation
20. Seminars
21. Expert consultancy
22. Others….

Detailed activities

Students' Activities

1. Identify and discus some basic assessments techniques for students with special needs and their challenges
2. Exercise how to assessments progresses of all students
3. Discus how to use portfolios for all students
4. Practice to develop assessment tools

Instructors Activities

5. Facilitate students learning by posing questions and guiding their activities
6. Provide activity guide for the students
7. Encourage all students to work on the activities in cooperative manner
8. Provide special support for those with difficulties or special need
9. Provide feedback on the students' various activities

Assessment Strategies and Techniques

23. Recording attendance
24. Recording group and individual participation
25. Recording the product f students
26. Test at the end of the unit

Unit 5: Differentiated services for populations of special needs

Time allotted: 5 hours

Unit Objectives

At the end of this unit, the students will be able to involve effectively in the following activities:

1. Demonstrate understanding of the individualized services plan for population with special needs as a means of ensuring that these

populations receive services opportunities tailored to their needs

2. Describe the purpose of an individualized services plan
3. Identify the components of an individualized services plan
4. Develop strategies for providing remediation to population with special needs
5. Identify applicable technologies and software that will be useful for persons with various
6. Use the internet and other technology tools to enhance services and developments for populations of persons with various special needs
7. Evaluate technology applications for population with special needs
8. Explain the need for interdisciplinary individualized services plan teams, and describe the role and responsibility of each team member
9. Develop group intervention and describe its approach

Unit Contents and sub contents

Strategies of mediation to students with special needs

10. Content-specific resources for students
11. Instructional technology
12. Individualized service plan
13. Interdisciplinary individualized services plan teams
14. Curriculum enrichment
15. The role and responsibilities of a general education teacher in the
16. implementation of the individualized services p
17. Planning group intervention

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

18. Interactive lectures

19. Group activities
20. Collaborative learning
21. Independent/self-learning
22. Institutional/school visits and practicum
23. Individual and group assignments and presentation
24. Seminars
25. Guest lecture
26. Others…

Detailed activities

Students' Activities

1. Define what individualized services plan mean
2. Discus the purposes of individualized services plan
3. List the components of individualized services plan
4. Discuss how individualized services plan could be realized in the school
5. Design and present single case individualized services plan.
6. Develop group intervention plan

Instructors Activities

7. Facilitate students learning by posing questions and guiding their activities
8. Provide activity guide for the students
9. Encourage all students to work on the activities in cooperative manner
10. Give assignments
11. Provide special support for those with who need it
12. Provide feedback on the students' various activities
13. Design and present the sample for good individualized services plan and group educational intervention.

Assessment Strategies and Techniques

27. Recording attendance
28. Recording group and individual participation
29. Recording the product of the students
30. Test at the end of the unit
31. Assignment

Unit 6. Promoting Positive Behaviors Institution-wide

Time allotted: 5 hours

Unit objectives

Upon the accomplishing this unit, the Higher education students will be able to perform the following activities.

1. Implement strategies for managing an inclusive environment effectively
2. Describe behavior management modifications in an inclusive environment
3. Use strategies to increase desirable behaviors while decreasing undesirable behaviors
4. Develop effective techniques for responding to inappropriate behavior both in and out of the classroom
5. Build positive social relationships between all populations with special needs.
6. Demonstrate understanding of the importance of collaboration in an inclusive environment

Unit Contents and sub contents

7. Behavior management modifications
8. Classroom management for inclusive environment
9. Social relationships and collaboration in an inclusive environment

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

10. Interactive lectures
11. Collaborative learning
12. Independent/self-learning
13. Institutional/school visits and practicum
14. Individual and group assignments and presentation
15. Seminars

16. Expert consultancy
17. Discussion
18. Others….

Detailed activities

Students' Activities

1. Discuss how to learn ways to create an inclusive community.
2. Explore how to modify the current environment.
3. Discuss techniques for relationship building in the inclusive environment.

Instructors Activities

4. Facilitate students learning by posing questions and guiding their activities
5. Encourage interactive approach.
6. Provide activity guide for the students
7. Encourage all students to work on the activities in cooperative manner
8. Provide special support for those with who need it
9. Provide feedback on the students' various activities

Assessment Strategies and Techniques

19. Recording attendance
20. Recording group and individual participation
21. Recording the product f students
22. Test at the end of the unit

Unit 7: Resources for the Inclusive environment

Time allotted: 5 hours

Unit objectives

At the end of this unit, the students will be able to accomplish the following tasks:

1. Apply constructivist techniques to create a conducive climate to diverse populations' success.
2. Find out existing resource that enhances success of inclusive environment.
3. Make adaptations based on the nature of the disabilities
4. Adapt communication for people with special needs education, such as, Braille, augmentative communication and Sign Language

Unit Contents and sub contents

5. Modification of environment and materials
6. Adapting learning and working process according to the needs
7. Identifying human material and other resources that help inclusive environmental activities.
8. Accessing adapted technologies
9. Accessing communication through various means such as Sign Language

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

10. Assignment
11. Interactive lectures
12. Visits and reporting
13. Collaborative learning
14. Independent/self-learning
15. Institutional/school visits and practicum
16. Individual and group assignments and presentation
17. Seminars
18. Expert consultancy
19. Others…

Detailed activities

Students' Activities

1. Review some high school curriculum in group and exercise how to adapt for learners
2. Adapting instructional techniques and present them in the classroom

Instructors Activities

3. Facilitate students learning by posing questions and guiding their activities
4. Provide activity guide for the students
5. Encourage all students to work on the activities in cooperative manner

6. Provide special support for those with difficulties and special needs
7. Provide feedback on the students' various activities

Assessment Strategies and Techniques

8. Recording attendance
9. Recording group and individual participation
10. Recording the product of students
11. Test at the end of the unit

Unit 8: Collaborative Partnerships with stakeholders

Time allotted: 5 hours

Unit objectives

At the end of this unit the students will be able to:

1. Identify key elements of successful collaboration
2. Describe the benefits and challenges of collaboration for various stockholders for the success of inclusive education
3. Explain the process of cop-planning, and develop strategies for effective co-planning and team learning and working
4. Identify characteristics of successful stockholders' partnerships,
5. Design and plan strategies for community involvement

Unit Contents and sub contents

6. Collaboration to successfully move towards inclusion
7. Planning Inclusive development in all sectors
8. Implementing inclusive
9. Individualized support as per the law, policies and directives
10. Evaluation and monitoring

General Approach/Methods/Strategies

This section is flexible to involve the instructor's creativity in identifying selecting and adapting the instructional method to the context of the learner. Some general approaches are listed below. The instructor can select among this and add his own that he/she feels appropriate.

11. Interactive lectures
12. Collaborative learning
13. Independent/self-learning

14. Institutional/school visits and practicum
15. Individual and group assignments and presentation
16. Seminars
17. Individual and group presentations
18. Expert consultancy
19. Others…

Detailed activities

Students' Activities

1. Discuss and sort out key elements of successful team or co teaching.
2. Discus the benefits and challenges of collaboration in the move towards inclusive education.
3. Identify and list resources for successful inclusion

Instructors Activities

4. Facilitate students learning by posing questions and guiding their activitiesProvide activity guide for the students
5. Encourage all students to work on the activities in cooperative manner
6. Provide special support for those with who need it
7. Provide feedback on the students' various activities

Assessment Strategies and Techniques

20. Recording attendance
21. Recording group and individual participation
22. Recording the product f students
23. Test at the end of the unit

9. Responsibilities

General Responsibilities of Instructors

Profile of teacher educator teaching this course must be the right professional in Special needs education. In the past, it was observed that non-special needs educators used to teach similar course. In order to produce quality teachers, this course should be offered only by teacher educator, MEd/or MA

or PhD in special needs education. To meet the learning outcome aforementioned and enhance teachers' quality, the special needs teacher educator will have the following major responsibilities.

1. Advise students on all the aspects of the course
2. Provide the students with the syllabus and other materials well ahead of the delivery of it
3. Conduct the interactive lectures as per the plan
4. Facilitate students' individual assignments, group assignments, field works, practicum, seminars, presentations, and collaborative learning
5. Periodically assess the students' work
6. Provide the students with timely feedbacks on their graded and ungraded academic works
7. Follow on students' progress and communicate to the students
8. Keep student records on the whole work of the students
9. Design and execute students' consultation program

General Responsibilities of Students

This course is designed for would teachers after completion of Bachelor degree in various fields. For successful completion of this course the teacher candidates would have the following responsibilities

10. Students are expected to actively and fully attend and participate all the in class and outclass learning activities. Missing a single class will cost students 2 points.
11. Carry out individual assignments, group assignments, field works, practicum as per the details and deadlines
12. Students are expected to read given materials before class
13. Students are expected to read selected books and ten articles
14. Actively participate in the planning, organizing and conducting of all the seminars and presentations
15. Reflect on feedbacks and initiate actions on them
16. Passing the exams successfully

10. General Course Assessment and Evaluation Methods learning

Dear teacher candidates, for each contents you will complete getting started activities, read selected materials complete course works and group assignments. Assessment of the students would be a continuous process. The following scheme of evaluation would be used:

1. Individual assignments 20% (optional, depending on the class size and

teacher educators teaching load)

2. Group assignment: 20%
3. Overall performance (punctuality, attendance, participation and collaboration): 10%. This is based on concrete records of punctuality, attendance and fruitful participation, that is measured by teacher educator
4. Written examination (could be more than one time): 50 to 70%

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