Wollo University (KiOT)
Department of Software Engineering

Course Title	Software Metrics
Course Code	SEng4132
CP	6 (3hr Lecture, 3hr Tutorial)
Module Title:	Software Design and Metrics
Module Number	13
Pre-requisites	SEng2054
Target group	4th year software engineering students
Semester	II
Status of Course	Compulsory
Instructor information	Name Samuel T. Email samueltemesgen158@gmail.com Mobile :+251965309196 Office : College of informatics building Office consultation hours: Tuesday 3:00 – 5:00 and Wednesday 9:00 – 11:00

Course Description

This course is a step by step description of the software metrics. It includes introduction to foundations of measurement theory, models of software engineering measurement, software products metrics, software process metrics and measuring management. The course is composed of the following basic modules: Measurement theory (overview of software metrics, basics of measurement theory, goal-based framework for software measurement, and empirical investigation in software engineering) Software product and process measurements (measuring internal product attributes: size and structure, measuring external product attributes: quality, measuring cost and effort, measuring software reliability, software test metrics, and object-oriented metrics). Measurement management

Learning Outcomes

At the end of the course students will be able to

- Understand the theoretical aspects of software measurements.
- Demonstrate the knowledge of software metrics.
- Demonstrate the knowledge of using software metrics in software development, software maintenance, and software project management.
- Demonstrate the knowledge of statistical analysis in software measurement.
- Demonstrate the knowledge of developing and calibrating predication systems.
- Demonstrate the knowledge of developing and maintaining a measurement program.

Prepared by:	Approved by	
	QA Focal person	Department Head:
Name: Samuel T.	Name: Samuel T	Name: Leul A.
Signature:	Signature	Signature
Date:	Date:	Date

NB
- ✓ The course outline must be approved and have the department stamp before duplication
- ✓ Should be submitted to the QA focal person, batch/section advisor and the department

Course contents and schedule

Weeks	Topics to be Discussed	Reference material	Learning outcomes
1	**1. Chapter 1: Overview of software metrics** 1.1.Introducing the course. 1.2.What is software measurement? 1.3.What are software metrics?	Reference book and Handout	After completing this chapter students are expected to - Know what does software metrics means - Know different software measurements
2	**2. Chapter 2:The basics of measurement** 2.1.Metrology 2.2.Property-oriented measurement 2.3.Meaningfulness in measurement 2.4.Measurement quality 2.5.Measurement process Scale 2.6.Measurement validation 2.7.Object-oriented measurement 2.8.Subject-domain-oriented measurement	Reference book and Handout	After completing this chapter students are expected to - Understand the basics of measurement - Understand property – oriented measurement - Identify meaningfulness in measurement and - Understand object oriented measurement
3 &4	**3. Chapter 3: Goal-based framework for software measurement** 3.1. Software measure classification 3.2. Goal-based paradigms: Goal-Question-Metrics (GQM) and Goal-Question 3.3. Indicator-Metrics (GQIM) 3.4. Applications of GQM and GQIM 3.5. Case studies	Reference book and Handout	After completing this chapter students are expected to - Know the different classification of software measure - Identify what is goal based paradigms, goal question metrics and goal question - Understand GQIM - Solve different case studies related to goal based metrics

5	**4. Chapter 4: Empirical investigation** 4.1. Software engineering investigation 4.2. Investigation principles 4.3. Investigation techniques 4.4. Formal experiments: Planning 4.5. Formal experiments: Principles 4.6. Formal experiments: Types 4.7. Formal experiments: Selection 4.8. Guidelines for empirical research	Reference book and Handout	After completing this chapter students are expected to - Understand software engineering investigation - Understand investigation principles and techniques - Identify guidelines of empirical research
6 & 7	**5. Chapter 5: Measuring internal product attributes: size** 5.1. Software size 5.2. Software Size: Length (code, specification, design) 5.3. Software Size: Reuse 5.4. Software Size: Functionality (function point, feature point, object point, use case point) 5.5. Software Size: Complexity	Reference book and Handout	After completing this chapter students are expected to - To measure internal product attribute which is size in terms of length , reusability , functionality and others
8&9	**6. Chapter 6: Measuring internal product attributes: structure** 6.1. Software structural measurement 6.2. Control-flow structure 6.3. Cyclomatic complexity 6.4. Data flow and data structure attributes 6.5. Architectural measurement	Reference book and Handout	After completing this chapter students are expected to - To measure internal product attribute which is structure
10&11	**7. Chapter7: Measuring cost and effort** 7.1. Software cost model 7.2. COCOMO and COCOMO II 7.3. Constraint model 7.4. Software Lifecycle Management (SLIM) 7.5. Cost models: advantages and drawbacks	Reference book and Handout	After completing this chapter students are expected to - To measure cost and effort of software's - Understand what is COCOMO and how to use it - Understand software lifecycle management (slim)

12	**8. Chapter 8: Measuring external product attributes: quality** 8.1. Software quality 8.2. Software quality models: Boehm's model, McCall's model, ISO 9126 model, etc. 8.3. Basic software quality metrics 8.4. Quality management models 8.5. Measuring customer satisfaction 8.6. Software Quality Assurance (SQA)	Reference book and Handout	After completing this chapter students are expected to - To measure external product attribute: quality - Understand different software quality model , Boehm's, McCall's and others - Understand software quality assurance
13	**9. Chapter 9: Measuring software: reliability** 9.1. Reliability concepts and definitions 9.2. Software reliability models and metrics 9.3. Fundamentals of software reliability engineering (SRE) 9.4. Reliability management models	Reference book and Handout	After completing this chapter students are expected to - To measure external product attribute: reliability - Understand reliability concepts - Understand software reliability engineering
14	**10. Chapter 10: Software test metrics** 10.1. Test concepts, definitions and techniques 10.2. Estimating number of test case 10.3. Allocating test times 10.4. Decisions based on testing 10.5. Test coverage measurement 10.6. Software testability measurement 10.7. Remaining defCP measurement	Reference book and Handout	After completing this chapter students are expected to - To define test and understand its concept and technique's - Estimate number of test cases - Understand decisions based testing
15&16	**11. Chapter 11:Object-oriented metrics** 11.1. Object-Oriented measurement concepts 11.2. Basic metrics for OO systems 11.3. OO analysis and design metrics 11.4. Metrics for productivity measurement 11.5. Metrics for OO software quality 11.6. Experience-based guidelines	Reference book and Handout	After completing this chapter students are expected to - Understand object oriented measurement concepts - Understand basic metrics for OO systems - Understand experience-based guidelines

Summary of Teaching Learning Methods

The course will be delivered in the form of lectures, demonstration, student presentations, group discussions, and individual and group project works.

Assessment Methods

The assessment methods for the course are

- Assignments (15%)
- Mid Examination (25%) – at the end of chapter 4
- Final examination (40%) - as per the institute schedule
- Project (20%) - chapter 5, 6 and 7

References

- Software Metrics: A Rigorous and Practical Approach, (2nd ed.), N.E. Fenton and S.L. Pfleeger, PWS Publishing, 1998.
- Metrics and Models in Software Quality Engineering, Stephen H. Kan, 2nd ed. , AddisonWesley Professional (2002).
- Software Engineering Measurement, John C. Munson, Auerbach Publications, 2003
- Software Metrics: Measurement for Software Process Improvement, BA Kitchenham, Blackwell Pub, 1996.
- Applied Software Measurement: Assuring Productivity and Quality, C. Jones, McGrawHill, 1996.
- Software Engineer's Reference Book, J. McDermid (Edt.), Butterworth Heinemann, 1993.
- Software Metrics: A Guide to Planning, Analysis, and Application, C. Ravindranath
- Pandian, Auerbach Publications, CRC Press Company, 2004