KISII UNIVERSITY

FACULTY OF INFORMATION SCIENCE AND TECHNOLOGY

CURRICULUM FOR BACHELOR OF SOFTWARE ENGINEERING (SOEN)

MAY 2014

1.0 INTRODUCTION

Software Engineering (SD) is about the orderly, timely and cost effective production of quality software that is not only useful but also usable. As such SD not only focuses on technology but also on the non-technical issues that are faced by software Engineers during the production of software. Research in this discipline shows that most of the software projects that fail because of reasons other than technology, therefore a Software Engineering degree should address these areas so that our graduates are able to address issues when they encounter them in their professional careers

2.0 JUSTIFICATION

Software Engineers are in great demand in this economy due to the expensive nature of imported software. The cost of software will come down tremendously when that software is produced by locally trained software engineers.

3.0 AIM AND OBJECTIVES

The aim of the programme is to produce graduates that are competent in the production of software and to be able to design and implement suitable software applications on a wide scale. The specific objectives are produce graduates that have:

3.1 Acquired both Theoretical and Practical skills in Software Engineering to be productive in society;

3.2 Acquired adequate knowledge to pursue postgraduate studies;

3.3 A basis for further research and solutions to Software Engineering problems that are customized for this region.

4.0 ADMISSION REQUIREMENTS

All candidates admitted to the degree programme Bachelor of Software Engineering (SOEN) must satisfy one of the following minimum requirements:

4.1 Direct entry for Degree in Software Engineering must have an aggregate grade of C+ in KCSE with at least grade C+ in English or Kiswahili, and Mathematics and Physics, or its equivalent.

4.2 Those holding a credit pass and above in Diploma in an IT related programme from an institution recognized by the Egerton University Senate.

4.3 Those holding qualifications equivalent to the above from institutions recognized by the Egerton University Senate.

5.0 LOADING AND DURATION OF STUDY

The SOEN programme shall be completed in four (4) academic years or 8 semesters for full-time students and a maximum of eight (8) academic years for part time students. A maximum transfer of thirty percent (30%) of the Senate-approved Credit Factors towards the requirements for the degree programme will be accepted, provided the candidate had obtained a grade 'B' or above in the specific relevant course. However, this is subject to approval by the faculty.

To qualify for the award of the degree of Bachelor of Software Engineering, a student must have completed and passed 164 Credit Factors. The C.Fs comprise of 116.5 in SOEN and 47.5 from Egerton University approved programmes.

6.0 COURSE CODING

The course codes are four capital letters namely, SOEN standing for Bachelor of Software Engineering followed by three digits.

6.1 The first digit indicates the year or level of the course is offered, i.e. 1,2,3,4.

6.2 The second digit indicates the nature of sub-discipline of the course within the discipline as follows:

- 0 - Programming
- 1 - Software Production
- 2 - General Courses.

6.3 The third digit represents the sequencing of the course.

7.0 EXAMINATIONS

7.1 All examinations for the SOEN programme will be conducted in accordance with the rules and regulations as stipulated in the Egerton University Statutes.

7.2 Candidates must pass the SOEN research project which is done individually with the help of an assigned supervisor.

7.3 Students are allowed to audit courses which shall be shown in the academic transcript. However, such courses shall not count towards the degree classification.

8.0 SCHEDULE OF COURSES

YEAR 1 SEMESTER 1

CODE	TITLE	L	P	C.F.
SOEN 101	Computer Programming	30	30	3.0
SOEN 111	Software Engineering Ethics	45	0	3.0
SOEN 122	Software Entrepreneurship	45	0	3.0
MATH 112	Basic Mathematics	45	0	3.0
PHIL 104	Philosophy & Society	45	0	3.0
ACMP 101	Introduction to Information Technology	45	15	3.5
ZOOL 143	Biology of HIV AIDS & Society	45	0	3.0
	TOTAL	**300**	**45**	**21.5**

YEAR 1 SEMESTER 2

CODE	TITLE	L	P	C.F.
COMP 103	Programming	45	15	3.5
SOEN 112	Foundations of Software Engineering	45	15	3.5
SOEN 123	Security Policy	45	0	3.0
MATH 111	Calculus I	45	0	3.0
MATH 141	Introductory Statistics	45	0	3.0
COMS 101	Communication Skills	45	0	3.0
COMP 100	Computer Architecture	45	15	3.5
	TOTAL	**315**	**30**	**22.5**

YEAR 2 SEMESTER 1

CODE	TITLE	L	P	C.F.
SOEN 201	Object Oriented Analysis	45	15	3.5
SOEN 202	Internet Programming	30	30	3.0
SOEN 211	Software Requirements	45	15	3.5
SOEN 216	Writing Skills for Software Engineers	45	15	3.5
BBIM 252	Data Communications & Networks	45	15	3.5
COMP 102	Discrete Mathematics	45	0	3.0
PHYS 103	General Physics	45	0	3.0
	TOTAL	**300**	**90**	**23**

YEAR 2 SEMESTER 2

CODE	TITLE	L	P	C.F.
SOEN 203	Programming Languages	45	15	3.5
SOEN 212	Software Design	45	15	3.5
SOEN 214	Mobile Application Development	45	15	3.5
SOEN 215	Software Quality Process	45	0	3.0
BBAM 301	Business Law I	45	0	3.0
COMP 206	Operating Systems	45	15	3.5
		270	**60**	**20**

YEAR 3 SEMESTER 1

CODE	TITLE	L	P	C.F.
SOEN 213	Software Development	45	15	3.5
SOEN 301	Component Development	30	30	3.0
COMP 301	Data Structures	45	15	3.5
COMP 302	Analysis of Algorithms	45	15	3.5
SOEN 311	Professional Practices & Ethics	45	0	3.0
SOEN 312	Group Dynamics	45	0	3.0
	TOTAL	**255**	**75**	**19.5**

YEAR 3 SEMESTER 2

CODE	TITLE	L	P	C.F.
SOEN 302	Modeling Foundations	45	15	3.5
SOEN 313	Software Economics	45	0	3.0
SOEN 314	Software Quality Assurance	45	0	3.0
SOEN 315	Embedded Systems	45	15	3.5
SOEN 316	Software Process	45	15	3.5
SOEN 321	Professional Attachment	0	90	3.0
COMP 308	Artificial Intelligence	45	0	3.0
	TOTAL	**270**	**135**	**22.5**

YEAR 4 SEMESTER 1

CODE	TITLE	L	P	C.F.
SOEN 421	Systems Project	15	60	3.0
SOEN 411	Software Models and Analysis	45	0	3.0
COMP 419	Software Project Management	45	15	3.5
SOEN 412	Software Validation & Verification	45	15	3.5
SOEN 413	Software Architectural Design	45	15	3.5
SOEN 414	Special Topics in Software Engineering	45	15	3.5
	TOTAL	**255**	**120**	**20**

YEAR 4 SEMESTER 2

CODE	TITLE	L	P	C.F.
SOEN 422	Systems Project	15	60	3.0
	4 ELECTIVES	180	60	15.0
		195	**120**	**18**

ELECTIVES

CODE	TITLE	L	P	C.F.
SOEN 423	Project Risk Management	45	15	3.5
SOEN 424	User Interface Design	45	15	3.5
SOEN 425	Systems Engineering	45	15	3.5
SOEN 426	Human Computer Interaction	45	15	3.5
SOEN 427	Systems Integration	45	15	3.5
SOEN 428	Multimedia Systems	45	15	3.5

9.0 COURSE DESCRIPTION

SOEN 101Computer Programming (30/30, C.F. 3.0)
Introduction to programming; introduction to the development environment (DE) that supports a higher level language. Variables, constants, data types, control structures, procedures, arrays, and text files. Simple programs used to express the programming concepts.

SOEN 111Software Engineering Ethics (45/0, C.F. 3.0)
Introduction to Software Engineering as a profession; examine software engineering challenges from an ethical perspective. Issues in ethics, professionalism and personal integrity. Moral code of conduct, professional code of conduct, and plagiarism.

SOEN 112 Foundations of Software Engineering (45/15, C.F. 3.5)
Fundamental software engineering techniques and methodologies; Various life cycle models, requirements analysis, modular principles of software design, development, testing, maintenance and implementation, software measurement, and software quality. structured and object-oriented analysis, systematic approach to testing and maintenance. Problem specification, periodic reviews, and documentation.
Prerequisite: SOEN 101

SOEN 122Software Entrepreneurship (45/0, C.F. 3.0)
Introduction to the business side of software; procedures of starting new ventures; legal aspects of business strategies. Formal agreements for payment of work done, billing clients. Costing of services. Developing a business plan. strategic planning and issues encountered while running a small business. Use of case studies.

SOEN 123Security Policy (45/0, C.F. 3.0)
Security issues in IT. Security issues in software engineering. Protecting code. Security policy development. End-user consideration in security policy formulation. Logical security and physical security. Encryption, decryption, authentication technologies, digital signatures, TCP/IP, firewalls, intrusion detection system.

SOEN 201Object Oriented Analysis (45/15, C.F. 3.5)
Concepts of Object-Orientated development, data abstraction, data encapsulation, inheritance, modularity, reusability. Identifying classes of objects. Object-oriented analysis and design. Object modeling dynamic modeling, functional modeling. classes, messages, methods. Adjustment of inheritance, Object representation: physical packaging documenting design. Use of language that supports true object orientation. Projects emphasize object-oriented problem solving and are implemented in languages
Prerequisite: SOEN 102

SOEN 202Internet Programming (30/30, C.F. 3.0)
Introduction to Internet application programming, scripting languages, user-interface design in a server delivered, browser-based environment. Syntax and debugging, web form processing and data validation using common programming structures, dynamic content using scripting languages, objects and cookies.
Prerequisite: SOEN 102

SOEN 203Programming Languages (45/15, C.F. 3.5)
Language definition, structure, data types, control structures, parameter passage, subprogram interface, block structured language. Information binding, mapping, data storage, execution environments, input/output, recursion, multiprocessing. Programming language design including data abstraction, concurrency, exception handling, subprograms, data types, control structures, and describing syntax and semantics. Alternative paradigms such as imperative, functional, logic, and object-oriented.
Prerequisite: SOEN 212

SOEN 211Software Requirements (45/15, C.F. 3.5)
Process of extracting and validating of software requirements from a customer, levels of user/customer involvement, dynamics of interviewing. Problem domain modeling using current analysis methods and supporting tools, rapid prototyping aids. Formal specifications in the validation process of requirements specifications, formal reasoning during software design; perform

proofs of correctness. Working knowledge of a formal specification language will be demonstrated by a project.
Prerequisite: SOEN 112

SOEN 212Software Design (45/15, C.F. 3.5)
Introduction to Software Design, Software design process, Introduction to Software Design Methods, Survey of Software Design Methods. Functional Design Methods: Structured Design, module coupling and cohesion criteria. Software Design Concepts, Transform Analysis, Transaction Analysis; concurrent task design, task interface design. Interpretation of specifications documents.
Prerequisite: SOEN 211

SOEN 213Software Engineering (45/15, C.F. 3.5)
Interpretation of design documents, development of software based on design specification documents. Determine when to use existing software components or to develop a new component.
Prerequisite: SOEN 212

SOEN 214Mobile Application Development (45/15, C.F. 3.5)
Mobile Technologies (SMS, MMS, GPRS, 3G), J2ME Programming, SMS Applications, Server-side Technologies (databases, SMS libraries, etc.) and emergent mobile technologies using J2ME (orientation awareness, location awareness, multimedia)
Prerequisite: SOEN 103

SOEN 215Software Quality Process (45/0, C.F. 3.0)
Concepts and techniques for developing high-quality software product. Models for viewing software components, software quality and of models to advocate quality activities; product quality and process quality. Use of case studies to elaborate quality issues.
Prerequisite: SOEN 103

SOEN 216Writing Skills for Software Engineers (45/15, C.F. 3.5)
Proposals and report writing, formatting of research paper, preparing software user manuals, preparation of brochures, curriculum vitae/resume, writing meeting minutes, presentation and technical writing techniques. Other business communication documents will also be covered.

SOEN 301Component Development (30/30, C.F. 3.0)
Prefabricated artifacts to be reused in Software Engineering. Components and objects, interfaces and explicit context dependencies, polymorphism, type checking and substitutability. Product line patterns, architectures will be discussed. Both technical aspects and engineering tradeoffs involved in creating reusable software; reengineering existing software to enhance its reusability. Reuse-driven development processes.
Prerequisite: SOEN 213

SOEN 302Modeling Foundations (45/15, C.F. 3.5)
Architectural, design, structural, behavioral models, and etc each model and a particular view of a desired system that it is intended to highlight. A combination of multiple models is needed to represent and understand the entire system. We use an example application throughout the paper to illustrate the concepts.
Prerequisite: SOEN 213

SOEN 311Professional Practices & Ethics (45/0, C.F. 3.0)
Impact of computers on society, computers and the law. Current issues relating to computers, ethics, and social values. Computer crime, computer abuse, social responsibility, risk analysis, cultural impact. Library and Internet research components. Issues in ethics and professional conduct in the profession, data privacy. Historical, social and economic consideration of the discipline. risks, and liabilities, and intellectual property relative to the computing/information systems profession. Software Engineering case studies will be used. Research paper is required
Prerequisite: SOEN 111, SOEN 215

SOEN 312Group Dynamics (45/0, C.F. 3.0)
Characteristics of Effective Groups, Group Development, Problem Solving Groups. Behavior of individuals and groups in goal seeking organizations. Characteristics of group leadership. Major characteristics of each of the stages of a group. Roles and expectations of group members. Trust in a group setting. Impact groups have on individuals. Social systems with an emphasis on leadership and authority, member roles, development, diversity,

inter-group relations. Small decision-making groups, larger social and political systems, group therapy, and diversity in group life.
Prerequisite: SOEN 301

SOEN 313Software Economics (45/0, C.F. 3.0)
Quality assessment, cost estimation, configuration management, software performance measures and management of the total quality environment for software development. Methods, tools, and techniques for estimating effort, scheduling, resource requirements, and risk factors as determined by required product features and quality attributes.
Prerequisite: SOEN 301

SOEN 314Software Quality Assurance (45/0, C.F. 3.0)
Software quality assurance (QA) & configuration management; maintenance of software process improvement to assure highest possible quality. Software process metrics; QA testing approaches, methods and techniques. QA plans, reviews, inspections and audits. Configuration control boards and methods for software process improvement.
Prerequisite: SOEN 301

SOEN 315Embedded Systems (45/15, C.F. 3.5)
Modern methods, techniques, and tools for specification and design of embedded systems. Development methods such as HOOD, and notations like UML, Petri-nets, etc. Analytical methods such as RMA. Performance evaluation based on modeling and simulation techniques is also covered. This is a project based course.
Prerequisite: SOEN 301

SOEN 316Software Process (45/15, C.F. 3.5)
Knowledge of commonly used software life-cycle process models. Institutional process standards; definition, implementation, measurement, management, change and improvement of software processes. Technical and managerial activities for software development and maintenance.
Prerequisite: SOEN 212

SOEN 321Professional Attachment (0/90, C.F. 3.0)
Professional Attachment to extend the knowledge gained in the academic programme. Develop skills needed to work in a Professional environment. Develop social, technical and communication skills needed to work effectively in a team. Assessment based on written attachment report, student logbook, and recommendation from the supervisor.
Prerequisite: SOEN 316

SOEN 411Software Models and Analysis (45/0, C.F. 3.0)
Sequential systems, Concurrent systems, Distributive systems, Reactive systems. Representation of software and software systems with means other than code, dataflow, class, activity, event-trace, structure charts, and state. Model-based User Interface Software Tools, Model-based Interface Development Environments, Interface Model, Declarative models
Prerequisite: SOEN 302

SOEN 412Software Validation & Verification (45/15, C.F. 3.5)
Software testing, Model checking and deductive techniques, Validation of UML diagrams, Static and dynamic verification, Formal specification languages, Test automation frameworks, Software metrics, Software defect management. Software Validation & Verification (V&V) for mission critical, simulation and enterprise information systems. Cognitive issues related to the V & V Software reliability and software maintainability.
Prerequisite: SOEN 314

SOEN 413Software Architectural Design (45/15, C.F. 3.5)
Introduction to Architecture and Design Patterns, Behavioral and object, architectural views, Scope of the Software, actors, users, deployment and components. Detailed software design, finite state machines, dynamic modeling. Subsystem Structuring Criteria.
Prerequisite: SOEN 301

SOEN 414Special Topics in Software Engineering (45/15, C.F. 3.5)
Current topics in the field of software engineering. Topics covered vary depending upon the research interests of the department. Research proposals. Research paper required.

Prerequisite: SOEN 315

SOEN 421Systems Project I (30/60, C.F. 4.0)
This is the first part of a two semester series that will entail the Final year project of the student. In this unit the student will learn to design & prepare a proposals and manuscripts, and research methods. The student will select an advisor, determine the project and submit the first four deliverables of the final year project which will be graded to make up the grade for the semester.
Prerequisite: SOEN 315

SOEN 422Systems Project II (15/60, C.F. 3.0)
This is the second of a two semester series that will entail the Final year project of the student. In this unit the student will submit the last four deliverables of the final year project which will be graded to make up the grade for the semester. The deliverables will include a written report, project demonstration, and presentations of findings of research.
Prerequisite: SOEN 421

SOEN 423Project Risk Management (45/15, C.F. 3.5)
Project Risk Identification, qualitative and quantitative Analysis methodologies. Risk Response. Project risks, product risks, and business risks. Risk management planning; contingency planning, contractual agreements. Monitoring and controling potential risks. Developing a risk response plan. Practical risk assessment and management processes
Prerequisite: SOEN 421

SOEN 424User Interface Design (45/15, C.F. 3.5)
Major frameworks, methods and approaches to designing, engineering, implementing, and testing user interfaces. User and usability requirements gathering, task analysis, coding of the user interface, evaluation with respect to requirements and the users' tasks. Numerous illustrative design and coding projects are completed throughout the term.
Prerequisite: SOEN 421

SOEN 425Systems Engineering (45/15, C.F. 3.5)
Introduction to systems engineering. Stating the problem, establishing the need for change, defining system functions. Investigate and evaluate alternatives. Modeling the system. System Integration, system launch. Assess performance, determine evaluation criteria, technical performance measures. Proper documentation of activities.
Prerequisite: SOEN 421

SOEN 426Human Computer Interaction (45/15, C.F. 3.5)
Human Computer Interaction (HCI) concepts. Introduction to Cognitive Psychology: memory, knowledge, learning, inference, and skill acquisition, procedural versus declarative knowledge. Cognitive Modeling. User action and task action grammars, and Payne's Yoked state space representation. Keystroke level Models, Production Rule Models, and Goal and plan analysis. Empirical HCI studies: Discovery Learning of a computational model, Effect of context on learning (the "Starship enterprise" study), Knowledge and action in menu based systems. Learning complex tasks: novice programmers. Analysis and classification of user errors in HCL. Principled design: the "star" Interface, BOXER, Social dimensions of HCI
Prerequisite: SOEN 421

SOEN 427Systems Integration (45/15, C.F. 3.5)
Integration of hardware, software, networks, video conferencing, management, services, and training. concepts and methods for designing, planning, contracting for and overseeing information technology infrastructure and applications are introduced. outsourcing technologies and services, issues involved in preparing, distributing, and evaluating requests for proposals and subsequent contract management issues. Students prepare and evaluate systems integration proposals.
Prerequisite: SOEN 421

SOEN 428Multimedia Systems (45/15, C.F. 3.5)
This course will cover hypertext, hypermedia, graphics, CD publishing, animation, audio, video, various file formats and their applications. Multimedia products and applications. Selection and

evaluation of various hardware and software options available. Students will develop multimedia information systems.
Prerequisite: SOEN 421