National School of Business Management

Faculty of Computing

UNDERGRADUATE
PROGRAMME SPECIFICATION

Programme Title: Bachelor of Science (Hons) in Software Engineering

Awards: BSc (Hon) in Software Engineering
BSc in Software Engineering

Mode of Study: Full-Time

Date of Production: July 2015

Date of Revision: July 2020

Contents

1. Educational Aims of the Programme

Software Engineering is the discipline of developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain, and satisfy all requirements that customers have defined for them.

The aims of the degree programme in Software Engineering are:

- to develop confidence to use latest concepts to design and develop Software solutions for an organization/individual;
- to develop lone learning aptitude to acquire new knowledge required for an assignment which associated with novel concepts;
- to admire intellectual works of others and to abide by industry norms and ethics stipulated by professional bodies;
- to communicate effectively and efficiently with clients and with peers both verbally and in writing;
- to collaborate in groups to achieve common goals;
- to satisfy the academic criteria required for the membership of professional institutions.

The BSc(Hons) graduates will be able to demonstrate thorough understanding of the core software engineering pronciples and their practical significance. Honors graduates will also be exposed to a wider specialized subject content required for diverse industries and knowledge on contemporary developments of the field.

In addition to the generic outcomes of an undergraduate programme (SLQF level 5/6), programmes in Software Engineering attempt to develop the following subject specific skills.

- Business analysis and process engineering skills
- Requirement analysis and software design skills
- Programming skills
- Hardware/software acquisition, implementation and maintenance trouble shooting skills
- Network design and implementation skills
- Database design and administration skills
- Internet and system security skills
- Project, people, and change management skills

Graduates join industry as entry level professionals in the field of software engineering and programming, testing and quality assurance, database administration, and development, business analysis and systems integration, and software architecture development.

Graduates who study at either three-year or four-year degree, can enter the employment market in various sectors. Main employment sectors include:

- Software development industry; state and private, organizations those provide ICT solutions to public and private sectors.
- Large enterprises; Banking, Insurance, Telecommunications, manufacturing, retail and digital services industries
- Education industry
- Government and defence
- Self employment (Entrepreneurs/Software service providers)

2. Graduate Attributes

Software Engineering Graduates should be able to demonstrate the following qualities.

Knowledge: Show mastery of software engineering knowledge and skills and of the professional standards necessary to begin practice as a software engineer. Demonstrate an understanding of and apply appropriate theories, models, and techniques that provide a basis for problem identification and analysis, software design, development, implementation, verification, and documentation.

Skills:
Design: Design appropriate solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal, and economic concerns.
Learning: Learn new models, techniques, and technologies as they emerge and appreciate the necessity of such continuing professional development.
Teamwork: Work both individually and as part of a team to develop and deliver quality software artifacts.
Leadership and management: Lead software development teams to achieve project objectives within the defined time frames. Reconcile conflicting project objectives, finding acceptable compromises within the limitations of cost, time, knowledge, existing systems, and organizations.
Communication: Effectively communicate with all stakeholders in a typical software development environment.

Attitudes:
Demonstrate an understanding and appreciation of the importance of negotiation, communication, effective work habits and teamwork. Demonstrate positive attitudes and social responsibility. Exercise initiative, personal responsibility and accountability and willingness to undertake further training and develop additional skills as required by the industry.

3. Programme Learning Outcomes

At the end of the study programme students should be able to:

Knowledge & Understanding: Demonstrate a systematic understanding of computing concepts and principles. Show mastery of software engineering knowledge and skills and of the professional standards necessary to begin practice as a software engineer.

Learning: Develop lines of argument and evaluate possible approaches, tools, techniques, platforms and solutions based on knowledge of Software Engineering principles and practices, and demonstrate understanding of the uncertainty, ambiguity and limitations of this knowledge.

Enquiry: Initiate and carry out Software Engineering projects. Ethically gather information pertaining to computing problems, possible solutions, and the success of these solutions, from existing or potential users and/or organisations using established Software Engineering practices. Find, critically evaluate, manage, apply, and understand information from a range of sources, acknowledging the cultural, ethical, economic, legal, and social issues surrounding the use of such information.

Analysis: Critically discuss current research in Software Engineering, and evaluate arguments, assumptions, abstract concepts and data (that may be incomplete) to draw conclusions.

Problem Solving: Design appropriate solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal, and economic concerns. Reconcile conflicting project objectives, finding acceptable compromises within the limitations of cost, time, knowledge, existing systems, and organizations.

Communication: Communicate ideas, problems and solutions to both specialist and non-specialist audiences in a variety of forms, including, but not limited to: written academic reports; verbal presentations; documentation in support of the development of software; project management documentation.

Application: Demonstrate an understanding of and apply appropriate theories, models, and techniques that provide a basis for problem identification and analysis, software design, development, implementation, verification, and documentation.

Reflection: Critically evaluate your performance as an academic and a professional Software Engineer, considering both process and product. Plan how to make your performance (process and product) more relevant and more effective.

Professional Practice: Work both individually and as part of a team to develop and deliver quality software artefacts. Demonstrate an understanding and appreciation of the importance of negotiation, effective work habits, leadership, and good communication with stakeholders in a typical software development environment. Demonstrate positive attitudes and social responsibility. Exercise initiative, personal responsibility and accountability and undertake further training and develop additional skills as required by the industry.

4. Programme Structure, Modules and Credits

BSc in Software Engineering is a 3 year programme with total credit weighting amounting to 90. BSc (Hons.) in Software Engineering is a 4 year programme with total credit weighting of 120. Each year students complete 30 credits by following 10 subject modules, each weighing 3 credits, except for the last 2 years where students undertake an Industry placement worth 8 credits in year 3 and an Award project worth 8 credits in Year 4.

A credit is defined as the workload of 15 lecture hours or 30/45 Tutorial/ Laboratory hours or 90 hours of industrial training. For a single credit, students are also expected to spend 2-2.5 hours on independent learning weekly over an average 15 weeks term.

4.1 Year 1 /Level 1 (SLQL 3)

In Year 1, students follow a curricula consisting of six Software Engineering core modules and four foundation (elective) modules from wider discipline of computing science and mathematics. Table 1 below, specifies the subject modules students follow at this level. This level of study lays a strong computing and software engineering foundation to the students on which they develop more specialised learning related to software engineering and systems and application specialties.

Table 1 – Level 1 modules for all Software Engineering awards.

Term	Module Code	Module Name	Credit Value
1 (18 weeks)	CS101.3	Introduction to Computer Science (Foundation/Elective)	3
	MA101.3	Mathematics I (Foundation/Elective)	3
	CS102.3	Programming in C (Core)	3
	CS103.3	Professional Development (Core)	3
2 (10 weeks)	CN101.3	Data communications and networks (Foundation/Elective)	3
	SE101.3	Object Oriented Programming with Java (Core)	3
3 (18 weeks)	CS106.3	Algorithms and Data structures (Core)	3
	CS104.3	Computer Architecture (Core)	3
	CS105.3	Database Management Systems (Core)	3
	SE102.3	Web Based Application Development (Foundation/Elective)	3

Note: Please refer module descriptors for module learning outcomes (and mappings to programme learning outcomes), detailed subject content and teaching & assessment strategies.

4.2 Year 2 /Level 2 (SLQL 4)

In Year 2, students continue to acquire core Software Engineering body of knowledge by following 5 core modules. Students also continue leaning 5 computing elective/foundation modules that provides them a strong computing foundation including exposure to business processes. Table 2 below specifies the modules for level 2. The waiting of each module is still 3 credits and the students take 10 modules at this level during the 3 terms of the fixed academic calendar of NSBM, with a consistent student workload across the academic year.

Table 2 – Level 2 modules for all Software Engineering awards.

Term	Module Code	Module Name	Credit Value
1 (18 weeks)	CS201.3	Operating Systems (Foundation/Elective)	3
	SE202.3	Introduction to Software Engineering (Core)	3
	MA201.3	Mathematics II (Core)	3
	SE201.3	Systems Analysis and Design (Core)	3
2 (10 weeks)	CS203.3	Algorithms and Complexity (Foundation/Elective)	3
	CN201.3	Computer Networks (Foundation/Elective)	3
3 (18 weeks)	SE204.3	Development of Enterprise Applications I (Foundation/Elective)	3
	SE205.3	Software Architecture (Core)	3
	SE206.3	Human Computer Interaction (Core)	3
	IS201.3	Business Processes and ERP (Foundation/Elective)	3

Note: Please refer module descriptors for further module details.

4.3 Year 3 /Level 3 (SLQL 5)

In Year 3, students continue to follow 8 core modules including the internship module that amounts to a total of 29 credits. Students are also offered 2 elective modules and they should choose at least one module to cover the credit requirement for Level 3. Table 3 below lists down the modules available at level 3.

At the end of Level 3 students have covered all core SE subject areas together with a significant number of elective modules addressing related systems and application specialties and provides an acceptable exit point for BSc in Software engineering award. Students those opt for the 3 year BSc in Software Engineering degree should undertake SE award project as a core module in addition to the other 8 core modules mentioned before and they do not have to take any elective modules.

Table 3 – Level 3 modules for the Software Engineering awards.

Module Code	Module Name	Credit Value	Type
MA301.3	Mathematics III	3	Core
SE304.3	Software Quality Assurance	3	Core
SE307.3	Social Issues and Professional Practice	3	Core
SE301.3	SW Process Management	3	Core
CS306.3	Information Assurance and Security	3	Core
SE309.3	Software Verification and Validation	3	Core
SE308.3	Software Process	3	Core
SE305.8	Internship (non-GPA)*	8	Core
SE303.3	Mobile Application Development	3	Elective
CS304.3	Advanced Database Management Systems	3	Elective
SE306.3	SE Award Project	3	Core**

Notes –
* Internship module does not contribute to the GPA calculation for the determination of the Award classification, but contributes to the credit requirement at Level 3.
** SE Award Project is only for the BSC in Software Engineering 3 year award.
Please refer module descriptors for further module details.

In year 3, Students undertake internship in a 18 week term along with one to two subjects delivered after hours and during the weekend. In the remaining two terms of Level 3, students continue to follow the remaining 5 to 6 subjects delivered after hours and the weekends.

4.4 Year 4 /Level 4 (SLQL 6)

In Year 4, BSc (Hons) in Software Engineering students follow 2 core modules including the award specific project that weigh 8 credits and continue throughout the year. To satisfy the credit requirement of Level 4, students have to undertake minimum of 7 elective modules from a total of 12 offered modules though all elective modules will not be offered in a given term. Table 4 specifies the modules available for level 4. Refer module descriptors for more information on each module.

Table 4 – Level 4 modules for all Engineering awards within the programme.

Module Code	Module Name	Credit Value	Type
BS401.3	Business Policy and Strategy	3	Core
SE401.6	SE Honours Award Project	8	Core
CS403.3	Intelligent Systems	3	Elective
CS404.3	Parallel and Distributed Computing	3	Elective
CS405.3	Data Warehousing and Data Mining	3	Elective
CS407.3	Internet of Things	3	Elective
CS408.3	Embedded Systems	3	Elective
SE403.3	Platform Based Development	3	Elective
SE402.3	Development of Enterprise Applications II	3	Elective
SE404.3	Agent Based Systems	3	Elective
CN402.3	Enterprise Networks	3	Elective
CS402.3	Computer Graphics and Visualization	3	Elective
IS401.3	Management Information Systems	3	Elective
IS402.3	E-Business Application Development	3	Elective

In the final year of study, students culminate their learning by acquiring specialized subject content required for diverse industries and knowledge on contemporary developments. Students also get an opportunity to showcase their learning over the years via the award specific project.

5. Admission Criteria

Three Passes in Physical Science stream (with mathematics as a subject) in a single sitting, at one of the following examinations or equivalent foreign qualifications is the minimum entry requirement. Equivalent foreign qualification is defined as the minimum requirement for admission to the first year of a UGC recognized university in that country.

a. G.C.E. Advanced Level examination conducted by the Department of Examinations, Sri Lanka
b. G.C.E Advanced Level examination conducted by Pearson Edexel, UK (London A/L)
c. International Advanced Level examination conducted by Pearson Edexel, UK
d. G.S.E Advanced Level examination conducted by Cambridge International Examinations, UK

OR

A minimum combined score of 1200 at the Scholastic Aptitude Test (SAT), conducted by the College Board, US

An admission committee shall supervise the selection process of students. This committee may include a member (or a nominee) from the UGC.

6. Module Grading, Progression and Graduation

6.1 Module Grading Scheme

The Grading System for study modules of this programme are given in Table 5.

Table 5 – Module Grading Scheme (Source: UGC Circular 901)

Range of Marks	Grade	Grade Point (GP)	Classification
85-100	A+	4.0	First Class
70-84	A	4.0	
65-69	A-	3.7	
60-64	B+	3.3	Second Upper
55-59	B	3.0	Second Lower
50-54	B-	2.7	Pass
45-49	C+	2.3	
40-44	C	2.0	
35-39	C-	1.7	NA
30-34	D+	1.3	
25-29	D	1.0	
00-24	F	0	

6.2 Module Completion

A student requires obtaining a minimum of 40 marks (C Grade/GP 2.0) for a module to be considered as having passed (completed) that module. Students not fulfilling this requirement for a module should retake the failed assessment components or the complete module with attendance as determined by the Module Examination Board. For the referred attempts for modules the marks are capped at 40 (C grade/GP 2.0). A completed module contributes the full credit allocation of that module towards the total credit requirement of the award.

A marginally failed module with a grade point not less than 1.3 could be compensated and award a pass (grade C/GP 2.0), on discretion of the award board. However, maximum of one module per level of study can be compensated and the final year project and industry placement modules shall not be compensated.

6.3 Progression

Students should pass all the required modules of a level to fulfill the credit requirement for that level. However, students can progress to study in the next level while having maximum of 3 outstanding modules (failed modules) in the previous levels.

6.4 Graduation and Award Classification

To complete an award and graduate, a student should complete all the module requirement of that award and gain 90 credits or more in total for BSc in Software Engineering award and 120 credits or more in total for BSc (Hons) in Software Engineering award.

For the determination of the award classification, average of the Module Grade Points (GP) weighted by the credit allocation is calculated across all modules, excluding any non-GPA modules (internship) as follows.

$$GPA = \frac{\sum_i^N Credit\_weight_i * GP_i}{N * \sum_i^N Credit\_weight_i}$$

The award classification is determined by applying the same criteria given for modules, which is shown in Table 5, to the GPA.

7. Programme Learning Outcomes to Graduate Attribute Mapping

The Table 6 below illustrates the Programme Learning Outcome mapping to the Software Engineering Graduate Attributes.

Table 6 – Programme Learning Outcomes vs. Graduate Attributes

Programme Learning Outcomes	Knowledge	Skills					Attitudes
		Design	Learning	Team Work	Leadership & management	Communication	
Knowledge & Understanding	X						X
Learning			X				X
Enquiry			X				X
Analysis		X					X
Problem Solving		X					X
Communication						X	X
Application		X					X
Reflection			X				X
Professional Practice				X	X	X	X

8. Module Learning Outcomes to Programme Learning Outcomes Mapping

The Table 7 below illustrates the Module Learning Outcomes mapping to the Programme Learning Outcomes.

Table 7 – Module Learning Outcomes vs. Programme Learning Outcomes

(Key to Programme Learning Outcomes in Table 7:

1. Knowledge & Understanding
2. Learning
3. Enquiry
4. Analysis
5. Problem Solving
6. Communication
7. Application
8. Reflection
9. Professional Practice)

Module Code	Module Name	Programme Learning Outcomes								
		1	2	3	4	5	6	7	8	9
CS101.3	Introduction to Computer Science	X			X	X		X		
MA101.3	Mathematics I	X		X		X		X		
CS102.3	Programming in C	X	X		X	X		X	X	X
CS103.3	Professional Development	X			X		X	X	X	X
CN101.3	Data communications and networks	X			X		X	X		X
SE101.3	Object Oriented Programming with Java	X	X	X	X	X		X	X	
CS106.3	Algorithms and Data structures	X	X	X	X	X		X	X	X
CS104.3	Computer Architecture	X	X	X		X		X		
CS105.3	Database Management Systems	X			X	X		X	X	X
SE102.3	Web Based Application Development	X		X	X	X	X	X		X
CS201.3	Operating Systems	X			X		X	X		
SE202.3	Introduction to Software Engineering	X		X	X			X	X	
MA201.3	Mathematics II	X		X				X		
SE201.3	Systems Analysis and Design	X	X		X		X	X		X
CS203.3	Algorithms and Complexity	X	X		X	X		X	X	X
CN201.3	Computer Networks	X	X	X	X	X				
SE204.3	Development of Enterprise Applications I	X			X	X		X		X
SE205.3	Software Architecture	X			X	X		X	X	
SE206.3	Human Computer Interaction	X			X	X		X		X
IS201.3	Business Processes and ERP	X			X	X		X	X	
MA301.3	Mathematics III	X	X		X	X		X		X
SE304.3	Software Quality Assurance	X			X			X	X	X
SE307.3	Social Issues and Professional Practice	X		X					X	X
SE301.3	SW Process Management	X			X			X	X	X
CS306.3	Information Assurance and Security	X			X			X	X	
SE309.3	Software Verification and Validation	X		X	X			X	X	X
SE308.3	Software Process	X			X			X	X	X
SE305.8	Internship (non-GPA)*	X					X			X
SE303.3	Mobile Application Development	X			X	X		X	X	
CS304.3	Advanced Database Management Systems	X		X	X	X	X	X	X	
SE306.3	SE Award Project		X		X	X	X	X	X	X
BS401.3	Business Policy and Strategy	X			X	X	X	X	X	X
SE401.6	SE Honours Award Project	X	X		X	X	X	X	X	
CS403.3	Intelligent Systems	X			X	X		X	X	X
CS404.3	Parallel and Distributed Computing	X			X	X		X	X	X
CS405.3	Data Warehousing and Data Mining	X			X	X	X	X	X	X
CS407.3	Internet of Things	X			X	X		X	X	X
SE403.3	Platform Based Development	X	X		X	X	X	X	X	X
SE402.3	Development of Enterprise Applications II	X			X	X		X		
SE404.3	Agent Based Systems	X			X	X		X		
CN402.3	Enterprise Networks	X			X				X	
CS402.3	Computer Graphics and Visualization	X			X			X	X	
IS401.3	Management Information Systems	X			X	X	X	X	X	X
IS402.3	E-Business Application Development	X			X	X		X	X	X
CS408.3	Embedded Systems	X	X	X	X	X			X	