





Course Title Software Validation and Verification

Course Code: MSCS 629

Program: Master Programme in Computer Science

Department: Computer Science

College: Computer Science and Information Technology

Institution: King Faisal University

Version: Course Specification Version Number

Last Revision Date: *Pick Revision Date.*





2023

ГРG-153



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A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (3-0-6)

2.	Course	type
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A. University

B. 🗌 Required

🛛 Elective

□Track

Department

3. Level/year at which this course is offered: Level 2

 \boxtimes College

4. Course general Description:

The validation and verification of software systems is a major issue in the IT industry. The main focus of this course will be proving and ensuring correctness of software systems. The topics include quality assurance, safety, fault tolerance, reliability, Techniques for validation and verification, Research-oriented in-depth study of Verification and Validation, Quality assurance at requirements and design phases, Software testing at unit, module, subsystem and system levels, Automatic and manual techniques for generating and validating test cases, Testing process including static vs. dynamic analysis, functional testing, inspections, and reliability assessment. Some other advanced topics will include Lambda Calculus, Natural Deduction, Term Rewriting, Functional Programming, Sets and Rule Induction, Data types and Recursion, Calculational and Monadic Reasoning, Imperative Program Verification and Hoare Logic, Separation Logic, Proofs.

5. Pre-requirements for this course (if any):

NA

6. Pre-requirements for this course (if any):

NA

7. Course Main Objective(s):

The objectives of this course are to evaluate verification and validation theory and practice from a software engineering perspective, research the history, principles and techniques of verification and validation across varied software domains, and apply verification and validation techniques and practices to various software artifacts across the development life cycle for both large and smaller software systems.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		





No	Mode of Instruction	Contact Hours	Percentage
2	Hybrid		
3	Traditional classroomE-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	-
3.	Field	-
4.	Tutorial	-
5.	Others (specify)	-
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and

Assessment Methods:

Code	Course Learning	Code of PLOs aligned	Teaching Strategies	Assessment Methods
1.0	Knowledge and unders	standing	Strategies	Methods
1.1	Understandthefundamentalapproachesandconcepts of the state-of-the-artsoftwarevalidationandverificationtechniques	К1	Lectures	- Quizzes - Exams - Assignments
1.2	Acquire knowledge of various aspects related to software quality assurance	К1	Lectures	- Quizzes - Exams - Assignments
2.0	Skills			
2.1	Applyfundamentalandrigorousprinciples,andcanbenefitfromformanyyearstoregardlessoftheevolutionoftechnologyto	S1, S2	- Lectures	- Quizzes - Exams - Assignments





Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and	d responsibility		
3.1	Implement Software Engineering Techniques on real world problems	V1	 Lectures Case studies Research assignment 	Project Report and Presentation

C. Course Content:

No	List of Topics	Contact Hours
1	Introduction, Syllabus, Fundamental of Testing and Analysis: Introduction to range of software verification and validation (V&V) Concepts,	3
	A Frame work for Test and Analysis	
2	Basic principles, Test and Analysis activities with in a S/W process, Basic techniques : Finite Models, Finite Abstraction of Behavior, Control flow graphs, Call Graphs, Finite State machines	6
3	Dependence and data flow models, Symbolic Execution and Proof of properties, Finite State Verification	6
4	Functional Testing, Testing strategies, Systematic Approach, Combinatorial, Structural, data flow, Model based testing	6
5	Testing Object Oriented Software, Test Execution, Inspection	6
6	Process: Planning and monitoring the process, System Acceptance, and Regressing Testing	3
7	Automating Analysis and Test, Documenting Analysis and Test	3
8	Lambda Calculus, Natural Deduction, Term Rewriting, Functional Programming	6
9	Sets and Rule Induction, Data types and Recursion, Calculation and Monadic Reasoning	3
10	Imperative Program Verification and Hoare Logic, Separation Logic, Proofs.	3
	Total	45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Continuous	10%
2.	Quiz	Continuous	10%
3.	Mid Term	8 th - 9 th	25%
4	Capstone Project	15 th	15%





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
5	Final Exam	16 th - 17 th	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Required Textbook	Software Testing and Analysis: Process, Principles, and Techniques by M. Pezzè, M. Young, Wiley, 2007. ISBN: 0471455938	
Essential References	 Logical Analysis of Hybrid Systems: Proving Theorems for Complex Dynamics, Springer, 2010. ISBN: 3642145086. Software Testing by Ron Patton, 2nd Edition, Sams Publishing, 2006. ISBN: 0672327988. 	
Supportive References		
Electronic Materials	Electronic Materials from Web Sites for any recent resources related to Software Verification and Validation	
Other Learning Materials	s Automated Software Testing Tools (Eg: Junit).	

2. Educational and Research Facilities and Equipment Required:

Items	Resources		
facilities (Classrooms, laboratories, exhibition room simulation rooms, etc.)	Sufficient seats (typically 20) as per student registration required in the lecture		
Technology equipment (Projector, smart board, software)	Sufficient computer terminals with required setup having the necessary software installed and configured for the students to complete assignments and projects. Data show is needed to demonstrate in the class		
Other equipment (Depending on the nature of the specialty	Not Required		
F. Assessment of Course Quality:			
Assessment Areas/Issues	Assessor Assessment Methods		
Effectiveness of teaching	Students Indirect Assessment Evaluation		





Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of students assessment	Faculty	IndirectassessmentthroughCourseEvaluation Survey
Quality of learning resources	Students	IndirectAssessmentthroughLearningResources Survey
The extent to which CLOs have been achieved	Faculty	Direct assessment through Rubrics analyses
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify) Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

