

## **IT4305- Rapid Software Development**

### **INTRODUCTION**

This is one of the courses designed for Semester 4 of the Bachelor of Information Technology Degree program. This course focuses on the software development process using Agile approach. Students will study Agile approaches such as Scrum, Extreme Programming, Lean, and Kanban. The lifecycle and practices of Scrum and Extreme Programming will be covered in detail.

### **CREDITS: 04**

### **LEARNING OUTCOMES**

After successful completion of this course students will be able to:

- Obtain a firm foundation on Agile concepts and methodologies.
- Acquire understanding of the practices and application of Agile practices Scrum and XP
- Learn how to apply the Agile framework in software Development Projects

### **MINOR MODIFICATIONS**

When minor modifications are made to this syllabus, those will be reflected in the Virtual Learning Environment (VLE) and the latest version can be downloaded from the relevant course page of VLE. Please inform your suggestions and comments through the VLE.

<http://vle.bit.lk>

### **ONLINE LEARNING MATERIALS AND ACTIVITIES**

You can access all learning materials and this syllabus in the VLE: <http://vle.bit.lk> , if you are a registered student of BIT degree program. It is very important to participate in learning activities given in the VLE to learn this subject.

### **ONLINE ASSIGNMENTS**

The assignments consist of two quizzes, First assignment quiz coversthe concepts of Scrum and second assignment covers Extreme Programming. Maximum mark for a question is10, minimum mark for a question is 0 (irrespective of negative scores).

Final mark is calculated considering 40% of assignment quiz 1 and 60% of assignment quiz 2. Pass mark for the online assignments in a course is 50. You are advised to do online assignments before the final exam of the course. It is compulsory to pass all online assignments to partially qualify to obtain year 2 certificate.

**FINAL EXAMINATION**

Final exam of the course will be held at the end of the semester.

Examination Paper will consist of two parts.

- Part 1: 1 Hour paper consisting of Multiple Choice Questions
- Part 2: 1 Hour paper consisting of Structured Questions

**OUTLINE OF SYLLABUS**

<b>Topic</b>	<b>Hours</b>
1- Introduction to Agile Software Development	01
2- Agile Principles	03
3- Introduction to Scrum	01
4- Core Concepts in Scrum	12
5- Scrum Roles	09
6- Scrum Planning	10
7- Sprinting	08
8- Alternative Approaches to Agile Software Development	16
<b>Total for the subject</b>	<b>60</b>

**REQUIRED MATERIALS****Main Reading**

**Ref 1:**Essential Scrum Practical Guide to the Most Popular Agile Process, Kenneth S. Rubin

**Ref 2:**The Art of Agile Development, James Shore and Shane Warden

## Supplementary Reading

**Ref 3:** Agile and Iterative Development: A Manager's Guide by Craig Larman, Agile Software development series, Alistair Cockburn and Jim Highsmith, Series Editors

URL 1 : Manifesto for Agile Software Development [ <http://agilemanifesto.org/>]

URL 2 : Lean Software Development [https://msdn.microsoft.com/en-us/library/hh533841.aspx]

## DETAILED SYLLABUS:

### Section 1: Introduction to Agile Software Development (01 hr)

#### Instructional Objectives

- Identify the significance of meeting deadline for organizational success.
- Explain how Agility becomes a successful way
- Understand the Principals behind the Agile Manifesto

#### Material /Sub Topics

- 1.1 Rational of Agile [Ref 2: pages 3-7]
- 1.2 How to use Agile [Ref 2: pages 9-12]
- 1.3 Agile Manifesto [ref URL1, ref 3 pages 369-373]
- 1.4 Scrum, Lean, Kanban, Extreme Programming [Ref 1: page 1, ref URL2, Ref 2: page 15]

### Section 2: Agile Principles (03 hrs)

#### Instructional Objectives

- Describe Agile principles
- Explain how Agile principles differ from traditional, plan-driven, sequential product development

#### Material /Sub Topics

- 2.1 Introduction [Ref 1: page 29]
- 2.2 Variability and Uncertainty [Ref 1: pages 32-36]
- 2.3 Prediction and Adaptation [Ref 1: pages 37-43]
- 2.4 Validated Learning [Ref 1: pages 44-46]
- 2.5 Work in Process (WIP) [Ref 1: pages 48-52]
- 2.6 Progress [Ref 1: pages 54-55]
- 2.7 Performance [Ref 1: pages 56-57]
- 2.8 Comparison Summary of Plan-Driven and Agile Principles [Ref 1: page 59]

**Section 3: Introduction to Scrum (01 hr)****Instructional Objectives**

- Explain the significance of Scrum
- Describe the usage of Scrum

**Material /Sub Topics**

- 3.1 What Is Scrum? [Ref 1: page 1]
- 3.2 History of Scrum [Ref 1: page 3]
- 3.3 Advantages of Scrum[Ref 1: page 4]
- 3.4 Genomica Results [Ref 1: page 4]
- 3.5 Use of Scrum [Ref 1: pages 5-9]

**Section 4: Core Concepts in Scrum(12 hrs)****Section 4.1: Scrum Framework(03hrs)****Instructional Objectives**

- Understand and apply the Scrum framework practices
- Identify the Scrum roles and their activities
- Describe the Scrum artifacts and rules

**Material /Sub Topics**

- 4.1.1 Introduction [Ref 1: page 13]
- 4.1.2 Scrum Roles [Ref 1: page 14]
  - 4.1.2.1 Product Owner [Ref 1: page 15]
  - 4.1.2.2 Scrum Master [Ref 1: page 16]
  - 4.1.2.3 Development Team [Ref 1: page 16]
- 4.1.3 Scrum Activities and Artifacts [Ref 1: page 16]
  - 4.1.3.1 Product Backlog [Ref 1: page 18]
  - 4.1.3.2 Sprints [Ref 1: page 20]
  - 4.1.3.3 Sprint Planning [Ref 1: page 21]
  - 4.1.3.4 Sprint Execution [Ref 1: page 23]
  - 4.1.3.5 Daily Scrum [Ref 1: page 23]
  - 4.1.3.6 Done [Ref 1: page 25]
  - 4.1.3.7 Sprint Review [Ref 1: page 26]
  - 4.1.3.8 Sprint Retrospective [Ref 1: page 27]

**Section 4.2 :Sprints (02hrs)****Instructional Objectives**

- Define what a Sprint is.
- Describe the characteristics of a Sprint.

- Choose the most suitable time span for a Sprint.
- Explain the term called “Timeboxing”.

### **Material /Sub Topics**

- 4.2.1 Introduction[Ref 1: page 61]
- 4.2.2 Timeboxed[Ref 1: pages 62-64]
- 4.2.3 Short Duration [Ref 1: pages 64-66]
- 4.2.4 Consistent Duration [Ref 1: pages 67-68]
- 4.2.5 No Goal-Altering Changes [Ref 1: pages 69-72]
- 4.2.6 Definition of Done [Ref 1: pages 74-77]

### **Section 4.3:Requirements and User Stories (03hrs)**

#### **Instructional Objectives**

- Discuss how the requirements are handled in a Scrum project.
- Explain how and when to use User Stories
- Describe and practice how to handle nonfunctional requirements and knowledge-acquisition in a scrum project.

### **Material /Sub Topics**

- 4.3.1 Introduction[Ref 1: page 79]
- 4.3.2 Using Conversations [Ref 1: page 81]
- 4.3.3 Progressive Refinement [Ref 1: page 82]
- 4.3.4 What Are User Stories? [Ref 1: pages 83-85]
- 4.3.5 Level of Detail [Ref 1: page 86]
- 4.3.6 INVEST in Good Stories [Ref 1: pages 88-92]
- 4.3.7 Nonfunctional Requirements [Ref 1: page 93]
- 4.3.8 Knowledge-Acquisition Stories [Ref 1: page 93]
- 4.3.9 Gathering Stories [Ref 1: pages 95-96]

### **Section 4.4:Product Backlog (02 hrs)**

#### **Instructional Objectives**

- Explain the importance of the Product Backlog and Product Backlog characteristics.
- Describe how to determine which and how many backlogs should exist.
- Explain “Backlog Grooming”.

### **Material /Sub Topics**

- 4.4.1 Introduction [Ref 1: page 99]
- 4.4.2 Product Backlog Items [Ref 1: page 100]
- 4.4.3 Good Product Backlog Characteristics [Ref 1: pages 101-103]
- 4.4.4 Grooming [Ref 1: pages 104-106]

- 4.4.5 Definition of Ready [Ref 1: page 108]
- 4.4.6 Flow Management [Ref 1: pages 110-111]
- 4.4.7 Which and How Many Product Backlogs? [Ref 1: pages 112-117]

## **Section 4.5: Estimation and Velocity (02hrs)**

### **Instructional Objectives**

- Describe the concepts of estimation and velocity.
- Discuss the items that should estimate and when and how to estimate them.
- Describe how to estimate product backlog items.
- Explain velocity and how to use a velocity range.

### **Material /Sub Topics**

- 4.5.1 Introduction [Ref 1: page 119]
- 4.5.2 What and When We Estimate [Ref 1: pages 120-122]
- 4.5.3 PBI Estimation Concepts [Ref 1: pages 123-125]
- 4.5.4 PBI Estimation Units [Ref 1: page 128]
- 4.5.5 Planning Poker [Ref 1: pages 129-133]
- 4.5.6 What Is Velocity? [Ref 1: page 133]
- 4.5.7 Calculate a Velocity Range [Ref 1: page 134]
- 4.5.8 Forecasting Velocity [Ref 1: page 135]
- 4.5.9 Affecting Velocity [Ref 1: page 135]
- 4.5.10 Misusing Velocity [Ref 1: page 137]

## **Section 5: Scrum Roles (9 hrs)**

### **Section 5.1: Product Owner (02 hrs)**

#### **Instructional Objectives**

- Explain product owner's roles and his responsibilities.
- Identify the correct product owner for different projects.
- Describe Product owner teams.

#### **Material /Sub Topics**

- 5.1.1 Introduction [Ref 1: page 165]
- 5.1.2 Principal Responsibilities [Ref 1: pages 166-171]
- 5.1.3 Characteristics/Skills [Ref 1: pages 171-173]
- 5.1.4 A Day in the Life [Ref 1: page 174]
- 5.1.5 Who Should Be a Product Owner? [Ref 1: pages 176-180]
- 5.1.6 Product Owner Combined with Other Roles [Ref 1: page 181]
- 5.1.7 Product Owner Team [Ref 1: pages 182-183]

**Section 5.2: Scrum Master (02 hrs)****Instructional Objectives**

- Describe the purpose of Scrum Master.
- Explain the principal responsibilities and characteristics of a Scrum Master.

**Material /Sub Topics**

- 5.2.1 Introduction [Ref 1: page 185]
- 5.2.2 Principal Responsibilities [Ref 1: pages 185-187]
- 5.2.3 Characteristics/Skills [Ref 1: pages 188-189]
- 5.2.4 A Day in the Life [Ref 1: page 190]
- 5.2.5 Fulfilling the Role [Ref 1: pages 191-192]

**Section 5.3: Development Team in Scrum (02 hrs)****Instructional Objectives**

- Describe the development team role.
- Describe principal responsibilities and characteristics of team role.

**Material /Sub Topics**

- 5.3.1 Introduction [Ref 1: page 195]
- 5.3.2 Role-Specific Teams [Ref 1: page 195]
- 5.3.3 Principal Responsibilities [Ref 1: pages 196-197]
- 5.3.4 Characteristics/Skills [Ref 1: pages 198-209]

**Section 5.4: Scrum Team Structures (01 hr)****Instructional Objectives**

- Discuss different methods of structuring Scrum teams.
- Discuss distinction between a feature team and a component team.
- Explain issues of coordinating multiple, collaborating Scrum teams.

**Material /Sub Topics**

- 5.4.1 Introduction [Ref 1: page 213]
- 5.4.2 Feature Teams versus Component Teams [Ref 1: page 213]
- 5.4.3 Multiple-Team Coordination [Ref 1: pages 218-220]

**Section 5.5: Managers (02 hrs)****Instructional Objectives**

- Discuss the responsibilities of functional-area managers.
- Discuss the project manager role in Scrum.

**Material /Sub Topics**

- 5.5.1 Introduction [Ref 1: page 225]
- 5.5.2 Fashioning Teams [Ref 1: pages 227-230]
- 5.5.3 Nurturing Teams [Ref 1: pages 231-233]
- 5.5.4 Aligning and Adapting the Environment [Ref 1: pages 233-234]
- 5.5.5 Managing Value-Creation Flow [Ref 1: pages 235-236]
- 5.5.6 Project Managers [Ref 1: pages 237-239]

**Section 6: Scrum Planning (10 hrs)****Section 6.1: Scrum Planning Principles (02 hrs) [Ref 1: page 245]****Instructional Objectives**

- Understand the principals in Scrum Planning
- Describe how to apply scrum principles in planning.

**Material /Sub Topics**

- 6.1.1 Introduction [Ref 1: page 247]
- 6.1.2 Don't Assume We Can Get the Plans Right Up Front [Ref 1: page 248]
- 6.1.3 Up-Front Planning Should Be Helpful without Being Excessive [Ref 1: page 248]
- 6.1.4 Keep Planning Options Open Until the Last Responsible Moment [Ref 1: page 249]
- 6.1.5 Focus More on Adapting and Replanning Than on Conforming to a Plan [Ref 1: page 249]
- 6.1.6 Correctly Manage the Planning Inventory [Ref 1: page 251]
- 6.1.7 Favor Smaller and More Frequent Releases [Ref 1: page 252]
- 6.1.8 Plan to Learn Fast and Pivot When Necessary [Ref 1: page 254]

**Section 6.2: Multilevel Planning (02 hrs)****Instructional Objectives**

- Understand principals behind Multi-level planning
- Discuss various Scrum planning activities and how they are interrelated with each other.

**Material /Sub Topics**

- 6.2.1 Introduction [Ref 1: page 257]
- 6.2.2 Portfolio Planning [Ref 1: page 259]



6.2.3 Product Planning (Envisioning) [Ref 1: pages 259-260]

6.2.4 Release Planning [Ref 1: page 261]

6.2.5 Sprint Planning [Ref 1: page 264]

6.2.6 Daily Planning [Ref 1: page 264]

### **Section 6.3: Portfolio Planning (02 hrs)**

#### **Instructional Objectives**

- Identify strategies for portfolio planning, grouped by scheduling, product inflow, and product outflow.
- Discuss how to determine whether or not more work should be invested in in-process products.

#### **Material /Sub Topics**

6.3.1 Introduction [Ref 1: pages 267-268]

6.3.2 Scheduling Strategies [Ref 1: pages 270-274]

### **Section 6.4: Envisioning (Product Planning) (02 hrs) [Ref 1: page 287]**

#### **Instructional Objectives**

- Describe the envisioning approach used in Scrum principles.

#### **Material /Sub Topics**

6.4.1 Introduction [Ref 1: pages 287-290]

6.4.2 SR4U Example [Ref 1: page 290]

6.4.3 Visioning [Ref 1: page 291]

6.4.4 High-Level Product Backlog Creation [Ref 1: page 294]

6.4.5 Product Roadmap Definition [Ref 1: page 295]

6.4.6 Other Activities [Ref 1: page 298]

6.4.7 Economically Sensible Envisioning [Ref 1: pages 299-305]

6.4.8 Closing [Ref 1: page 306]

### **Section 6.5: Release Planning (Longer-Term Planning) (02 hrs) [Ref 1: page307]**

#### **Instructional Objectives**

- Discuss how release planning fits into the Scrum framework.
- Discuss how to perform release planning on both fixed-date and fixed-scope releases.

**Material /Sub Topics**

- 6.5.1 Introduction [Ref 1: pages 307-309]
- 6.5.2 Release Constraints [Ref 1: pages 311-314]
- 6.5.3 Grooming the Product Backlog [Ref 1: page 315]
- 6.5.4 Refine Minimum Releasable Features (MRFs) [Ref 1: page 316]
- 6.5.5 Sprint Mapping (PBI Slotting) [Ref 1: page 316]
- 6.5.6 Fixed-Date Release Planning [Ref 1: page 318]
- 6.5.7 Fixed-Scope Release Planning [Ref 1: page 323]
- 6.5.8 Calculating Cost [Ref 1: page 325]
- 6.5.9 Communicating [Ref 1: pages 326-329]

**Section 7:** Sprinting (8 hrs) [Ref 1: page 333]

**Section 7.1:** Sprint Planning [Ref 1: page 335] (02 hrs)

**Instructional Objectives**

- Understands sprint Planning Approaches
- Understands and apply sprint planning process in Scrum .

**Material /Sub Topics**

- 7.1.1 Introduction [Ref 1: pages 335-336]
- 7.1.2 Approaches to Sprint Planning [Ref 1: pages 338-339]
- 7.1.3 Determining Capacity [Ref 1: pages 340-342]
- 7.1.4 Selecting Product Backlog Items [Ref 1: page 343]
- 7.1.5 Acquiring Confidence [Ref 1: page 344]
- 7.1.6 Refine the Sprint Goal [Ref 1: page 346]
- 7.1.7 Finalize the Commitment [Ref 1: page 346]

**Section 7.2:** Sprint Execution (02 hrs)

**Instructional Objectives**

- Discuss the principles and techniques that guide how the Scrum team plans, manages, performs, and communicates during sprint execution.

**Material /Sub Topics**

- 7.2.1 Introduction [Ref 1: pages 347-348]
- 7.2.2 Sprint Execution Planning [Ref 1: page 349]
- 7.2.3 Flow Management [Ref 1: pages 349-354]
- 7.2.4 Daily Scrum [Ref 1: page 354]
- 7.2.5 Task Performance—Technical Practices [Ref 1: page 355]
- 7.2.6 Communicating [Ref 1: pages 356-359]

**Section 7.3: Sprint Review (02 hrs)****Instructional Objectives**

- Describe the sprint review, i.e. its purpose, its participants, and the work required to make it happen.
- Identify common sprint review issues.

**Material /Sub Topics**

- 7.3.1 Introduction [Ref 1: page 363]
- 7.3.2 Participants [Ref 1: page 364]
- 7.3.3 Sprint Review Pework [Ref 1: pages 365-368]
- 7.3.4 Sprint Review Approach [Ref 1: pages 368-371]
- 7.3.5 Sprint Review Issues [Ref 1: pages372-373]

**Section 7.4: Sprint Retrospective (02 hrs)****Instructional Objectives**

- Describe the purpose of and participants in the sprint retrospective.
- Identify pre-work and major activities associated with a sprint retrospective.

**Material /Sub Topics**

- 7.4.1 Introduction [Ref 1: page 375]
- 7.4.2 Sprint Retrospective Participants [Ref 1: page 377]
- 7.4.3 Sprint Retrospective Pework [Ref 1: pages 378-380]
- 7.4.4 Sprint Retrospective Approach [Ref 1: pages 380-390]
- 7.4.5 Sprint Retrospective Follow Through [Ref 1: page 391]
- 7.4.6 Sprint Retrospective Issues [Ref 1: page 392]

**Section 8: Alternative Approaches to Agile Software Development(16 hrs)****Section 8.1: Introduction to Extreme Programming XP (03 hrs)****Instructional Objectives**

- Explain the XP life cycle.
- Understands the XP team features.

**Material /Sub Topics**

- 8.1.1 Introduction [Ref 2: page 15]

- 8.1.2 Introduction to XP Lifecycle [Ref 2: pages 17-22]
- 8.1.3 The XP Team [Ref 2: page 28]
  - 8.1.3.1 The Whole Team [Ref 2: page 28]
  - 8.1.3.2 On-Site Customers [Ref 2: page 29]
  - 8.1.3.3 Programmers [Ref 2: page 33]
  - 8.1.3.4 Testers [Ref 2: page 34]
  - 8.1.3.5 Coaches [Ref 2: page 35]
  - 8.1.3.6 Other Team Members [Ref 2: page 36]
  - 8.1.3.7 The Project Community [Ref 2: page 36]
  - 8.1.3.8 Filling Roles [Ref 2: page 39]
  - 8.1.3.9 Team Size [Ref 2: page 39]

## **Section 8.2: XP Practices (03 hrs)**

### **Instructional Objectives**

- Explain pair programming and its usage.
- Understands Energized *Work*.
- Define Informative Workspace, Root Cause Analysis and Retrospectives.

### **Material /Sub Topics**

- 8.2.1 Introduction [Ref 2: page 73]
- 8.2.2 Pair Programming [Ref 2: pages 74-81]
- 8.2.3 Energized Work [Ref 2: pages 82-86]
- 8.2.4 Informative Workspace [Ref 2: pages 86-90]
- 8.2.5 Root-Cause Analysis [Ref 2: pages 91-63]
- 8.2.6 Retrospectives [Ref 2: pages 94-100]

## **Section 8.3: Collaboration in XP (03 hrs)**

### **Instructional Objectives**

- Describe practices that help a team and its stakeholders collaborate efficiently and effectively.
- Practice Coding standards.
- Practice Iteration demos and Reporting.

### **Material /Sub Topics**

- 8.3.1 Introduction [Ref 2: page 101]
- 8.3.2 Trust [Ref 2: pages 103-112]
- 8.3.3 Sit Together [Ref 2: pages 113-120]
- 8.3.4 Real Customer Involvement [Ref 2: pages 121-124]
  - 8.3.4.1 Contraindications [Ref 2: page 125]

- 8.3.4.2 Alternatives [Ref 2: page 125]
- 8.3.5 Ubiquitous Language [Ref 2: pages 125-129]
- 8.3.6 Stand-Up Meetings [Ref 2: pages 130-133]
- 8.3.7 Coding Standards [Ref 2: pages 133-138]
- 8.3.8 Iteration Demo [Ref 2: pages 138-143]
- 8.3.9 Reporting [Ref 2: pages 143-151]

## **Section 8.4: Product Releasing in XP (02 hrs)**

### **Instructional Objectives**

- Describe the ways that can be used to leverage the release.
- Discuss Version Controlling, Continuous integration, Collective code ownership and documentation.

### **Material /Sub Topics**

- 8.4.1 “Done Done” [Ref 2: pages 155-159]
- 8.4.2 No Bugs [Ref 2: pages 159-168]
- 8.4.3 Version Control [Ref 2: pages 169-177]
- 8.4.4 Ten-Minute Build [Ref 2: pages 177-183]
- 8.4.5 Continuous Integration [Ref 2: pages 183-191]
- 8.4.6 Collective Code Ownership [Ref 2: pages 191-195]
- 8.4.7 Documentation [Ref 2: pages 195-198]

## **Section 8.5: Planning Process in XP (03 hrs)**

### **Instructional Objectives**

- Define Release Planning and Planning Game.
- Discuss Risk Management, Iteration Planning and Slack.
- Describe Stories and Estimating.

### **Material /Sub Topics**

- 8.5.1 Introduction [Ref 2: page 201]
- 8.5.2 Vision [Ref 2: pages 202-207]
- 8.5.3 Release Planning [Ref 2: pages 207-220]
- 8.5.4 The Planning Game [Ref 2: pages 221-225]
- 8.5.5 Risk Management [Ref 2: pages 226-234]
- 8.5.6 Iteration Planning [Ref 2: pages 234-246]
- 8.5.7 Slack [Ref 2: pages 247-253]
- 8.5.8 Stories [Ref 2: pages 255-261]

8.5.9 Estimating [Ref 2: pages 261-272]

**Section 8.6:** Product Development in XP (02 hrs)

### **Instructional Objectives**

- Describe Incremental Requirements.
- Explain and understand application of Test Driven Development.
- Understand Refactoring.
- Understand Incremental Design and Architecture.
- Understand Performance Optimization and Exploratory Testing.

### **Material /Sub Topics**

8.6.1 Introduction [Ref 2: page 273]

8.6.2 Incremental Requirements [Ref 2: pages 275-279]

8.6.3 Customer Tests [Ref 2: pages 280-287]

8.6.4 Test-Driven Development [Ref 2: pages 287-305]

8.6.5 Refactoring [Ref 2: pages 306-316]

8.6.6 Simple Design [Ref 2: pages 316-323]

8.6.7 Incremental Design and Architecture [Ref 2: pages 323-333]

8.6.8 Spike Solutions [Ref 2: pages 333-336]

8.6.9 Performance Optimization [Ref 2: pages 336-339]