

**FR. Conceicao Rodrigues College Of Engineering**

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

**Department of Information Technology**

**B.E. (IT) (semester VII) (2020-2021)**

**Lesson Plan:**

**Subject: Software Testing and Quality Assurance (ITDLO7034)**

**Credits-4**

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Practical /Oral	Tutorial	Total
ITDLO7034	Software Testing and Quality Assurance	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme								
		Theory Marks					Term Work	Practical & Oral	Oral	Total
		Internal assessment			End Sem. Exam					
		Test1	Test2	Avg. of two Tests						
ITDLO7034	Software Testing and Quality Assurance	20	20	20	80	--	--	--	100	

**Course Objectives:** Students will try to learn:

- 1 Basic software debugging methods.
- 2 White box testing methods and techniques.
- 3 Black Box testing methods and techniques.
- 4 Designing test plans.
- 5 Different testing tools (familiar with open-source tools)
- 6 Quality Assurance models.

**Course Outcomes:** Students will be able to:

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement

3. Design test planning.
4. Manage the test process
5. Apply the software testing techniques in commercial environment
6. Use practical knowledge of a variety of ways to test software and an understanding of some of the trade-offs between testing techniques.

**Prerequisite:** Software Engineering.

**Detailed syllabus:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>	<b>CO Mapping</b>
0	Prerequisite	<b>Software Engineering Concepts</b>	02	--
I	Testing Methodology	Introduction, Goals of Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs Exhaustive Software Testing, Software Failure Case Studies, Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing methodology, Verification and Validation, Verification requirements, Verification of high level design, Verification of low level design, validation.	09	CO1
II	Testing Techniques	Dynamic Testing: Black Box testing: boundary value analysis, equivalence class testing, state table based testing, cause-effect graphing based testing, error guessing.  White box Testing Techniques: need, logic coverage criteria, basis path testing, graph matrices, loop testing, data flow testing, mutation testing. Static Testing.  Validation Activities: Unit validation, Integration, Function, System, Acceptance Testing.  Regression Testing: Progressive vs. Regressive, regression testing produces quality software, regression testability, objectives of regression testing, regression testing types, define problem, regression testing techniques.	08	CO2 CO3
III	Managing the Test Process	Test Management: test organization, structure and of testing group, test planning, detailed test design and test specification.  Software Metrics: need, definition and classification of software matrices.  Testing Metrics for Monitoring and Controlling the Testing Process: attributes and corresponding metrics, estimation model for testing effort, architectural design, information flow	08	CO4

		matrix used for testing, function point and test point analysis.  Efficient Test Suite Management: minimizing the test suite and its benefits, test suite minimization problem, test suite prioritization its type , techniques and measuring effectiveness.		
IV	Test Automation	Automation and Testing Tools: need, categorization, selection and cost in testing tool, guidelines for testing tools. Study of testing tools: JIRA, Bugzilla, TestDirector and IBM Rational Functional Tester, Selenium etc.	09	CO1  CO5
V	Testing for specialized environment	Agile Testing, Agile Testing Life Cycle, Testing in Scrum phases, Challenges in Agile Testing  Testing Web based Systems: Web based system, web technology evaluation, traditional software and web based software, challenges in testing for web based software, testing web based testing	08	CO2  CO3
VI	Quality Management	Software Quality Management, McCall's quality factors and Criteria, ISO 9126 quality characteristics, ISO9000:2000, Software quality management	06	CO6

**Text Books :**

1. Software Testing Principles and Practices Naresh Chauhan Oxford Higher Education
2. Software Testing and quality assurance theory and practice by Kshirasagar Naik, Priyadarshi Tripathy , Wiley Publication

**References :**

1. Effective Methods for Software Testing , third edition by Willam E. Perry, Wiley Publication
2. Software Testing Concepts and Tools by Nageswara Rao Pusuluri , Dreamtech press

## **Assessment:**

### **Internal Assessment for 20 marks:**

Consisting of **Two Compulsory Class Tests**

Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

**End Semester Examination:** Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions, each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus.**
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

## 2. Course Outcome Statement

Sr.No.	Course Outcome Statement
ITDLO7034.1	Explain software testing methodology and terminology
ITDLO7034.2	Implement various test processes for quality improvement
ITDLO7034.3	Describe different test processes
ITDLO7034.4	Apply software testing techniques in commercial environment
ITDLO7034.5	Describe different quality standards

## 3.CO-PO and CO-PSO Mapping

Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
ITDLO7034.1	1													2
ITDLO7034.2		2		2										2
ITDLO7034.3	1													2
ITDLO7034.4	2				3									2
ITDLO7034.5	1													2

## 4. CO Assessment Tools

	Direct Methods				Indirect Methods
					Course Exit Survey
ITDLO7034.1	UT1(60%)	Quiz(10%)	UE(30%)		100%
ITDLO7034.2	UT1(60%)	Quiz(10%)	UE(30%)		100%
ITDLO7034.3	UT1(60%)	Quiz(10%)	UE(30%)		100%
ITDLO7034.4	UT2(70%)	UE(30%)			100%
ITDLO7034.5	UT2(70%)	UE(30%)			100%

## 5. Course Outcomes Target:

Upon Completion of this course, students will be able to :

ITDLO7034.1: Explain software testing methodology and terminology [B2:Comprehension]

Target level: 2.0

ITDLO7034.2: Implement various test processes for quality improvement [B3:Application]

Target level: 2.0

ITDLO7034.3: Describe different test processes [B2:Comprehension]

Target level: 2.0

ITDLO7034.4: Apply software testing techniques in commercial environment [B3:Application]

Target level: 2.0

ITDLO7034.5: Describe different quality standards [B2:Comprehension]

Target level: 2.0

## 7. Lesson Plan

No of classes available:	46	1. No of Classes taken: 2.Total Remedial Lectures	48 -	
Sr. No.	Topic Planned with CO	Planned Date	Actual Date	Delivery Mechanisms
	Don't forget to include CO dissemination			
1.	Testing Methodology <b>(ITDLO7034.1)</b>	28-07-21	28-07-21	ppt, notes
2.	Testing Techniques <b>(ITDLO7034.2)</b>	15-10-21	15-10-21	ppt, notes
3.	Managing the Test Process <b>(ITDLO7034.3)</b>	29-10-21	29-10-21	ppt, notes
4.	Test Automation <b>(ITDLO7034.4)</b>	11-11-21	11-11-21	ppt, notes
5.	Testing for specialized environment <b>(ITDLO7034.4)</b>	13-11-21	13-11-21	ppt, notes
6.	Quality Management <b>(ITDLO7034.5)</b>	19-11-21	19-11-21	ppt, notes

## Date wise lecture plan

Date	Topic Taught	Link of recorded lecture	Date	Topic Taught	Link of recorded lecture
14-07-2020	Syllabus, Course Outcomes, Introduction, Goals of software testing	<a href="https://drive.google.com/file/d/1pAg5VK-OWUHuzVpCmHfOf6JU17uZ1Ic/view?usp=sharing">https://drive.google.com/file/d/1pAg5VK-OWUHuzVpCmHfOf6JU17uZ1Ic/view?usp=sharing</a>	15-07-2020	Software testing definitions, Model for software testing, Effective vs. exhaustive testing	<a href="https://drive.google.com/file/d/1yKZNZmrVHLGNHewt_pzc3EgXkQVpyVAO/view?usp=sharing">https://drive.google.com/file/d/1yKZNZmrVHLGNHewt_pzc3EgXkQVpyVAO/view?usp=sharing</a>
16-07-2020	Path testing, Software failure case studies, Software testing terminology	<a href="https://drive.google.com/file/d/1Pvvq5mbgwmqf rCZxwIXzBP7Nep6eSaGP/view?usp=sharing">https://drive.google.com/file/d/1Pvvq5mbgwmqf rCZxwIXzBP7Nep6eSaGP/view?usp=sharing</a>	21-07-2020	Bugs, Life Cycle of bugs, Testing principles, software testing lifecycle-planning	<a href="https://drive.google.com/file/d/1RjHB2-yyASDIB3nHnh4Oaa184Tz5w-Qj/view?usp=sharing">https://drive.google.com/file/d/1RjHB2-yyASDIB3nHnh4Oaa184Tz5w-Qj/view?usp=sharing</a>
22-07-2020	Software testing life cycle- design, execution, post-execution, Software testing methodology	<a href="https://drive.google.com/file/d/1yGI2WwzQvn_uH1u2yBf9d4c5jb12gsCW/view?usp=sharing">https://drive.google.com/file/d/1yGI2WwzQvn_uH1u2yBf9d4c5jb12gsCW/view?usp=sharing</a>	23-07-2020	Considerations in developing testing methodologies, verification and validation, verification of requirements	<a href="https://drive.google.com/file/d/1ZPX3XVVgtTGkTz2zEx4aoi4aCScE3Vx/view?usp=sharing">https://drive.google.com/file/d/1ZPX3XVVgtTGkTz2zEx4aoi4aCScE3Vx/view?usp=sharing</a>
28-07-2020	Verification of High level and low level design, Validation, Discussion on questions related to the chapter	<a href="https://drive.google.com/file/d/1jmjeb5r9tIRNaZHish857BRtt4adXXxC/view?usp=sharing">https://drive.google.com/file/d/1jmjeb5r9tIRNaZHish857BRtt4adXXxC/view?usp=sharing</a>	29-07-2020	Dynamic Testing, Black Box Testing, Boundary Value Analysis and examples	
30-07-2020	Boundary Value Analysis examples and introduction to equivalence class partitioning	<a href="https://drive.google.com/file/d/1Y1K6b1i31c6Ijm08wqLzxf1KqyPjmFPa/view?usp=sharing">https://drive.google.com/file/d/1Y1K6b1i31c6Ijm08wqLzxf1KqyPjmFPa/view?usp=sharing</a>	04-08-2020	Equivalence class partitioning	<a href="https://drive.google.com/file/d/1Y45Mc1nmXNCBtV5LTR5cgvhwZtX_MZX4/view?usp=sharing">https://drive.google.com/file/d/1Y45Mc1nmXNCBtV5LTR5cgvhwZtX_MZX4/view?usp=sharing</a>
05-08-2020	Lecture cancelled due to Xoriant Placement drive	Adjusted on 06-08-2020	06-08-2020	Equivalence class partitioning examples, FSM (Taken for 2 hrs)	<a href="https://drive.google.com/file/d/1O7ewq1xTfcsH4njHGR5EIQklwYOQfT0/view?usp=sharing">https://drive.google.com/file/d/1O7ewq1xTfcsH4njHGR5EIQklwYOQfT0/view?usp=sharing</a>



11-08-2020	State table-based testing example, decision table-based testing	<a href="https://drive.google.com/file/d/1ijl35fKA4VYeJl4VDX6CtUFMpHoasyiU/view?usp=sharing">https://drive.google.com/file/d/1ijl35fKA4VYeJl4VDX6CtUFMpHoasyiU/view?usp=sharing</a>	12-08-2020	Decision table-based testing examples, cause and effect graphing	<a href="https://drive.google.com/file/d/1bsmWOBEQrcz9k8b1Of_Fvy16UNBgaqAn/view?usp=sharing">https://drive.google.com/file/d/1bsmWOBEQrcz9k8b1Of_Fvy16UNBgaqAn/view?usp=sharing</a>
13-08-2020	Cause and effect graphing example, Orthogonal Array Testing, Error guessing	<a href="https://drive.google.com/file/d/17rXtyLyOVQQLXWGb32j5RxKs7PJGRbH-/view?usp=sharing">https://drive.google.com/file/d/17rXtyLyOVQQLXWGb32j5RxKs7PJGRbH-/view?usp=sharing</a>	18-08-2020	White box testing, need of white box testing, introduction to basis path testing	<a href="https://drive.google.com/file/d/1INFwVNg1sCXxAsiG4-ai8jZsXY70QfId/view?usp=sharing">https://drive.google.com/file/d/1INFwVNg1sCXxAsiG4-ai8jZsXY70QfId/view?usp=sharing</a>
19-08-2020	Control flow graph notations, Cyclomatic complexity	<a href="https://drive.google.com/file/d/1XMCn3hu5TzSAXxrVemLpGKaIEbi803SL/view?usp=sharing">https://drive.google.com/file/d/1XMCn3hu5TzSAXxrVemLpGKaIEbi803SL/view?usp=sharing</a>	20-08-2020	Examples on basis path testing	<a href="https://drive.google.com/file/d/1H0qf6BSI-2Q3Juhhp7tloPX3tV1dsEiC/view?usp=sharing">https://drive.google.com/file/d/1H0qf6BSI-2Q3Juhhp7tloPX3tV1dsEiC/view?usp=sharing</a>
01-09-2020	Examples on basis path testing	<a href="https://drive.google.com/file/d/1FO5TI27MH7zz3msV5hAMpl-ZDNjwJr9g/view?usp=sharing">https://drive.google.com/file/d/1FO5TI27MH7zz3msV5hAMpl-ZDNjwJr9g/view?usp=sharing</a>	02-09-2020	Example on basis path testing, applications of path testing	<a href="https://drive.google.com/file/d/1nycX_ECtyKEDLdJQISnCAQZL5feJjG_/view?usp=sharing">https://drive.google.com/file/d/1nycX_ECtyKEDLdJQISnCAQZL5feJjG_/view?usp=sharing</a>
03-09-2020	Graph Matrix, Connection matrix, Applications in finding cyclomatic complexity and m-link paths	<a href="https://drive.google.com/file/d/1ju8tsYfK_YHWD057TYwpgblbOwrcZSeU/view?usp=sharing">https://drive.google.com/file/d/1ju8tsYfK_YHWD057TYwpgblbOwrcZSeU/view?usp=sharing</a>	08-09-2020	Loop Testing, Data Flow Testing	<a href="https://drive.google.com/file/d/1iHBxH-2f1sAi0I75S3TM5S2JTVLzLkU3/view?usp=sharing">https://drive.google.com/file/d/1iHBxH-2f1sAi0I75S3TM5S2JTVLzLkU3/view?usp=sharing</a>
09-09-2020	Data flow testing, static data flow testing	<a href="https://drive.google.com/file/d/13tZBgXxIbfLT--HK8Dh-Wn1wkcMltnqw/view?usp=sharing">https://drive.google.com/file/d/13tZBgXxIbfLT--HK8Dh-Wn1wkcMltnqw/view?usp=sharing</a>	10-09-2020	Dynamic data flow testing, mutation testing	<a href="https://drive.google.com/file/d/1wMdkBKAdzi1SWRhAKaqwKyvk9dhnEl7c/view?usp=sharing">https://drive.google.com/file/d/1wMdkBKAdzi1SWRhAKaqwKyvk9dhnEl7c/view?usp=sharing</a>
22-09-2020	Validation Unit tests, Drivers	<a href="https://drive.google.com/file/d/1mOLuIIWAiCDT-DRRCuZqifH7TWVEUAqK/view?usp=sharing">https://drive.google.com/file/d/1mOLuIIWAiCDT-DRRCuZqifH7TWVEUAqK/view?usp=sharing</a>	23-09-2020	Stubs, example of unit validation testing, Non incremental integration testing	<a href="https://drive.google.com/file/d/1dGmBQ9_JLLZRI_zolhElpsaZfiyvc_hi/view?usp=sharing">https://drive.google.com/file/d/1dGmBQ9_JLLZRI_zolhElpsaZfiyvc_hi/view?usp=sharing</a>
24-09-2020	Incremental testing, top-down and bottom-up testing	<a href="https://drive.google.com/file/d/1PBmZlw0mRR4JJ9sN_Mf5dAl6f122RpeL/view?usp=sharing">https://drive.google.com/file/d/1PBmZlw0mRR4JJ9sN_Mf5dAl6f122RpeL/view?usp=sharing</a>	29-09-2020	Lecture cancelled due to placement.	Adjusted on 30-09-2020

30-09-2020	Call graph based integration and basics of path based integration (From 8:30PM-10.15PM)	<a href="https://drive.google.com/file/d/1qvHd3cVctJn9aVn4w6l1en5oWLC_LSE-/view?usp=sharing">https://drive.google.com/file/d/1qvHd3cVctJn9aVn4w6l1en5oWLC_LSE-/view?usp=sharing</a>	01-10-2020	Path based integration testing, function testing, introduction to system testing	<a href="https://drive.google.com/file/d/1LNs35j7iUwgvTv9OxgbD6KvNOno1uPqZ/view?usp=sharing">https://drive.google.com/file/d/1LNs35j7iUwgvTv9OxgbD6KvNOno1uPqZ/view?usp=sharing</a>
06-10-2020	Reliability testing, Recovery testing	<a href="https://drive.google.com/file/d/1vP14zdyRY46KXd8cdm9sqBT7ZkwXi142/view?usp=sharing">https://drive.google.com/file/d/1vP14zdyRY46KXd8cdm9sqBT7ZkwXi142/view?usp=sharing</a>	08-10-2020	Security testing, performance testing	<a href="https://drive.google.com/file/d/1OUZiAJadvO5wWy_bHKJ-iDmGfoa4PE6g/view?usp=sharing">https://drive.google.com/file/d/1OUZiAJadvO5wWy_bHKJ-iDmGfoa4PE6g/view?usp=sharing</a>
09-10-2020	Load testing, Stress testing, Usability testing, Compatibility testing, User Acceptance Testing	<a href="https://drive.google.com/file/d/16xsXwkqan7kW-ItKInLgRgGMaMNGtNut/view?usp=sharing">https://drive.google.com/file/d/16xsXwkqan7kW-ItKInLgRgGMaMNGtNut/view?usp=sharing</a>	13-10-2020	Regression testing introduction	<a href="https://drive.google.com/file/d/17EgyUGIsIRBR5zPB84UKNpzL7D3fkMAL/view?usp=sharing">https://drive.google.com/file/d/17EgyUGIsIRBR5zPB84UKNpzL7D3fkMAL/view?usp=sharing</a>
14-10-2020	Objectives of regression testing, regression testing types, selective regression testing	<a href="https://drive.google.com/file/d/10dRFuqq1gjinlizNqO9l8ESdoANG23-PX/view?usp=sharing">https://drive.google.com/file/d/10dRFuqq1gjinlizNqO9l8ESdoANG23-PX/view?usp=sharing</a>	15-10-2020	Regression testing techniques, evaluation metrics for selection techniques	<a href="https://drive.google.com/file/d/1ENna0QZiH5Zeg9FIUbmR_WBrBWIGNTQ/view?usp=sharing">https://drive.google.com/file/d/1ENna0QZiH5Zeg9FIUbmR_WBrBWIGNTQ/view?usp=sharing</a>
27-10-2020	Structure of testing group, testing skills, test planning	<a href="https://drive.google.com/file/d/1oRgfY4TPrziLUSRredOzkQRBXKceOkRP/view?usp=sharing">https://drive.google.com/file/d/1oRgfY4TPrziLUSRredOzkQRBXKceOkRP/view?usp=sharing</a>	28-10-2020	Test plan document, test planning process: Master plan, V& V plan and test plan hierarchy	<a href="https://drive.google.com/file/d/1BLgWCxG-rYsnlGcMyZMxZeUvMuYOZoTt/view?usp=sharing">https://drive.google.com/file/d/1BLgWCxG-rYsnlGcMyZMxZeUvMuYOZoTt/view?usp=sharing</a>
29-10-2020	Validation test plan, Unit test plan, integration test plan, functional test plan, system test plan	<a href="https://drive.google.com/file/d/12vxbGO06xxtq70v9x0Mr0L4f284wazQ9/view?usp=sharing">https://drive.google.com/file/d/12vxbGO06xxtq70v9x0Mr0L4f284wazQ9/view?usp=sharing</a>	03-11-2020	Detailed test plan- test design specification, test case specification, test log	<a href="https://drive.google.com/file/d/11O-MXcPlygeipl9B6P9ijZcq-V1lw7a/view?usp=sharing">https://drive.google.com/file/d/11O-MXcPlygeipl9B6P9ijZcq-V1lw7a/view?usp=sharing</a>

04-11-2020	Test incident report, test summary report, Software metrics and their classification, Halstead metric with example	<a href="https://drive.google.com/file/d/19kbHtstnz5cAnxHHLf0fDRMu8Uyxfsa/view?usp=sharing">https://drive.google.com/file/d/19kbHtstnz5cAnxHHLf0fDRMu8Uyxfsa/view?usp=sharing</a>	05-11-2020	Software metric with design architecture, information flow, Cyclomatic complexity and FP	<a href="https://drive.google.com/file/d/1tShewlkMK_i9Tb12PogB-HxTJRBD8tov/view?usp=sharing">https://drive.google.com/file/d/1tShewlkMK_i9Tb12PogB-HxTJRBD8tov/view?usp=sharing</a>
10-11-2020	Test Point Analysis with example, test suit minimization problem and its benefits	<a href="https://drive.google.com/file/d/1qi9P4GSNDBMnngdJtkWJt2J9YBuQkW3N/view?usp=sharing">https://drive.google.com/file/d/1qi9P4GSNDBMnngdJtkWJt2J9YBuQkW3N/view?usp=sharing</a>	11-11-2020	Test prioritization types and techniques	<a href="https://drive.google.com/file/d/1cl0cqM5NAxmjZxzwQEonvN3r3AHO6hww/view?usp=sharing">https://drive.google.com/file/d/1cl0cqM5NAxmjZxzwQEonvN3r3AHO6hww/view?usp=sharing</a>
12-11-2020	Test case automation, agile testing	<a href="https://drive.google.com/file/d/1WDzeJvB6ZmObf-hoD90SNntNzfwLejcw/view?usp=sharing">https://drive.google.com/file/d/1WDzeJvB6ZmObf-hoD90SNntNzfwLejcw/view?usp=sharing</a>	13-11-2020	Testing web based systems ( <i>Extra lecture</i> )	<a href="https://drive.google.com/file/d/1oRgfY4TPrziLUSRred0zkQRBXKceOkRP/view?usp=sharing">https://drive.google.com/file/d/1oRgfY4TPrziLUSRred0zkQRBXKceOkRP/view?usp=sharing</a>
14-11-2020	McCall's quality factors and Criteria ( <i>Extra Lecture</i> )	<a href="https://drive.google.com/file/d/1dGmbQ9_JLLZRl_zolhElpsaZfiyvc_hi/view?usp=sharing">https://drive.google.com/file/d/1dGmbQ9_JLLZRl_zolhElpsaZfiyvc_hi/view?usp=sharing</a>	19-11-2020	ISO 9126 standard, ISO 9000:2000	<a href="https://drive.google.com/file/d/1WDzeJvB6ZmObf-hoD90SNntNzfwLejcw/view?usp=sharing">https://drive.google.com/file/d/1WDzeJvB6ZmObf-hoD90SNntNzfwLejcw/view?usp=sharing</a>

