LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Computer Science and Design (703)

Bachelor of Engineering (B.E.) – Semester – I

Course Code:	**017033191**
Course Name:	**Software Engineering**
Category of Course:	Professional Core Course (PCC)
Prerequisite Course:	-

Teaching Scheme				
Lecture (L)	**Tutorial (T)**	**Practical (P)**	**Credit**	**Total Hours**
3	**0**	**2**	**4**	**20**

Syllabus

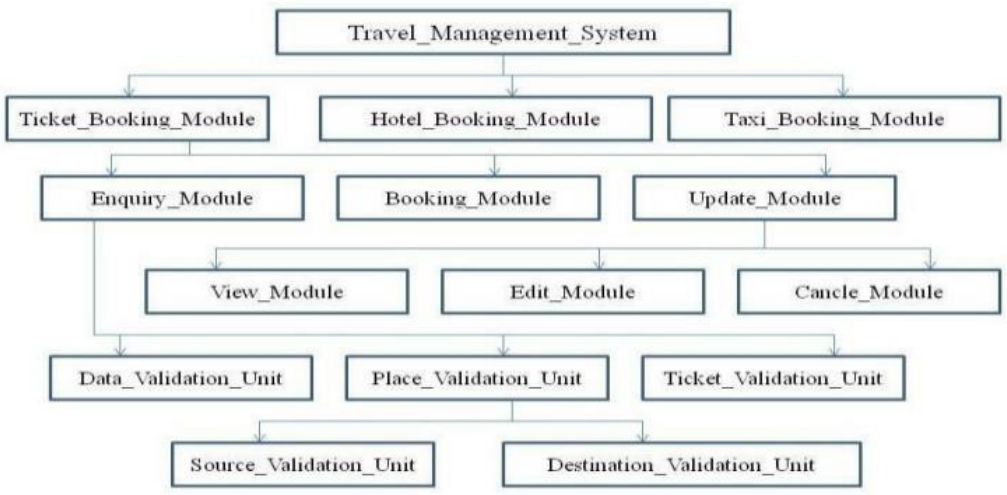
Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	**Introduction to Software Engineering and Software Process Models**			**3 (15%)**
	1.1 Basic Concepts of Software Engineering, Software Development Life-Cycle.	---	---	
	1.2 Study of Different Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Spiral Model.			
02	**Agile Development**			**1 (5%)**
	2.1 Agile Process, Extreme Programming.	---	---	
	2.2 Scrum Model	---		
03	**Requirement Analysis and Specification**			**2 (10%)**
	3.1 Requirement Gathering and Analysis, Feasibility Analysis.	---	---	
	3.2 Software Requirement Specification (SRS).	---		
04	**Function Oriented Analysis and Design**			**1 (5%)**
	4.1 Data Modelling Concepts	---	---	
	4.2 Data Flow Model (DFD Diagram).			
05	**Object Oriented Analysis and Design**			**3 (15%)**
	5.1 Use-Case Diagram, Activity diagram, Class diagram	----	---	
	5.2 State diagram, sequence diagram			
06	**Software Project Management**			**3 (15%)**
	6.1 Process and Product Metrics (Size Oriented and Function Oriented).	---	---	
	6.2 Empirical Estimation Model-COCOMO Model.	---		
	6.3 Project Scheduling and Tracking	---		
07	**Testing Types**			**2 (10%)**
	7.1 Software Testing Fundamentals	---	---	
	7.2 Unit Testing, Integration, Acceptance Testing, Validation Testing and System Testing.			
08	**Testing Techniques**			**2 (10%)**
	8.1 Test Case Design.	---	---	
	8.2 White-Box Testing and Black-Box Testing.	---		
09	**Software Quality Assurance**			**2 (10%)**
	9.1 Software Quality Assurance.	---	---	
	9.2 The ISO9000 Quality Standards, Software Reliability.			
	9.3 CMM			
10	**Software Configuration and Maintenance Management**			**1 (5%)**
	10.1 SCM Process.	---	---	
	10.2 Version Control, Change Management.	---		

Major Components/ Equipment

Sr. No.	Component/Equipment
1	Computer

2	Microsoft Visio, Testing tool, Project Management tool (Cloud based or desktop based),Version Control Tool(GIT,SVN or any other)

Sr No.	Practical Title	Link to Theory Syllabus
Choose any one project and do the following exercises with respect to selected project definition. A. Hotel Management System B. Library Management system C. Hostel Management System D. Blood bank Management System E. Laboratory Management System F. College Management System G. Online Furniture Selling platform for single vendor H. Online Clothes Selling platform for multiple vendor I. Vendor Management system for E-commerce System J. Online Job Portal K. Online Books Auction L. Art gallery Management System. M. HR Management System N. Stock Management Portal O. Inventory Management System		
1.	Write the Feasibility study and accordingly decide the complete problem statement of **your chosen Project.**	Unit – 3
2.	What are the factors that influence the choice of SDLC models? Analyze each of them for **your chosen Project** and decide which SDLC model is most suitable.	Unit – 1
3.	Which are other models apart from SDLC models? Is any of them suitable for **your chosen Project?** If not, Justify.	Unit – 2
4.	Identify the requirement development activities for **your chosen Project.** Also specify list of functional and non-functional requirements for the same.	Unit – 3
5.	Identify different modules for **your chosen Project** along with their detailed description.	Unit – 3
6.	Draw the DFD-Level 0 for **your chosen Project**	Unit – 4
7.	Draw the DFD-Level 1 for **your chosen Project**	Unit – 4
8.	Draw the DFD-Level 2 for **your chosen Project**	Unit – 4
9.	Describe the user scenarios for **your chosen Project** with pre and post conditions.	Unit – 5
10.	Draw the use case diagram for **your chosen Project**	Unit – 5
11.	Draw the state diagram for **your chosen Project**	Unit – 5
12.	Draw the class diagram for **your chosen Project**	Unit – 5
13.	Draw the sequence diagram for **your chosen Project**	Unit – 5
14.	Draw the activity diagram for **your chosen Project**	Unit – 5
15.	Online loan system has two modules for the two basic services, namely Car loan service and House loan service. The two modules have been named as Car_Loan_Module and House_Loan_Module. Car_Loan_Module has 2000 lines of uncommented source code. House_Loan_Module has 3000 lines of uncommented source code. Car_Loan_Module was completely implemented by Mike. House_Loan_Module was completely implemented by John. Mike took 100 person hours to implement Car_Loan_Module. John took 200 person hours to implement House_Loan_Module. Mike's module had 5 defects. John's module had 6 defects. With respect to the context given, which among the following is an INCORRECT statement? Choose one: 1. John's Quality is better than Mike's Quality 2. John's Productivity is more than Mike's Productivity 3. John introduced more defects than Mike 4. John's Effort is more than Mike's Effort Also Calculate size-oriented metrics for **your chosen Project.**	Unit – 6
16.	Compute the function point, productivity, documentation, cost per function for the following data: 1. Number of user inputs = 24 2. Number of user outputs = 46 3. Number of inquiries = 8 4. Number of files = 4 5. Number of external interfaces = 2 6. Effort = 36.9 p-m 7. Technical documents = 265 pages 8. User documents = 122 pages 9. Cost = $7744/ month Various processing complexity factors are: 4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 2, 2, 4, 5. Also Calculate Function Oriented metrics for **your chosen Project.**	Unit – 6
17.	Suppose a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the three model i.e., organic, semi-detached & embedded. Also using COCOMO model calculate effort and development time for **your chosen Project.**	Unit – 6
18.	Show how project scheduling is carried out for **your chosen Project** using open source framework – GanttProject (Or any other tool of your choice)	Unit – 6
19.	Show how project management is carried out for **your chosen Project** using – JIRA (Or any other tool of your choice)	Unit – 6
20.	In the context of the above defect categories, classify the following statements under the defect categories and mention in the table given below.	Unit – 7

	1. Divide by Zero Error is not guarded 2. Usage of 3.14 in the statement Circle_Area = 3.14 * Radius * Radius; 3. 3500 lines of code in a single function 4. A pointer is declared but not initialized. It is used in the program for storing a value. 5. A program designed to handle 1000 simultaneous users, crashed when 1001 the user logged in. 6. A "while" loop never exits 7. User interface displays "MALFUNCTION 54" when something goes wrong in the back-end 8. No documentation (comments) for the source code 9. Hungarian Notation not followed while coding, even though the coding guide lines mandate to use Hungarian Notation 10. Pressing of "Tab" key moves the cursor in different fields of a web form randomly. **Statement / Defect Category / Defect Name** 1 2 3 4 5 6 7 8 9 10	
21.	Perform unit testing using JUNIT(Or any other testing tool).	Unit – 7
22.	Consider the scenario of development of software for Travel Management System (TMS) is in progress. The TMS software has 3 major modules namely Ticket_Booking_Module, Hotel_Booking_Module and Taxi_Booking_Module.The Ticket_Booking_Module has 3 sub modules namely Enquiry_Module,Booking_Module andUpdate_Module. The enquiry module uses Date_Validation_Unit,Ticket_Validation_Unitand Place_Validation_Unit.  In the context of the given scenario, identify the usage of stub or driver for the following situations. 1. Except the Ticket_validation_Unit, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is in progress for the TMS software. To carry out the integration testing, which among the following is necessary? a) A Stub for Ticket_Validation_Unit b) A Driver For Ticket_Validation_Unit c) A Stub for Enquiry_Module d) A Driver for Enquiry_Module e) A Stub For Ticket_Booking_Module f) A Driver For Ticket_Booking_Module 2. The coding and unit testing of all the module, sub modules and units of TMS are completed except the Update_Module (coding and testing for Edit_Module, Cancel_Module and View_Module are also completed). The bottom-up integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing? 3. Except the Taxi_Booking_Module, the coding and unit testing of all other modules, sub modules and units of TMS are completed. The top-down integration is to be started for the TMS software. Mention any stub or driver needed to carry out the integration testing?	Unit – 7
27.	Design different test cases for **your chosen Project**	Unit – 8

28.	Draw CFG for following problems and show statement coverage, branch coverage and path coverage for each. Also Calculate cyclomatic complexity.
	Problem 1:-
	IF A = 354
	THEN IF B > C
	THEN A = B
	ELSE A = C
	END IF
	END IF
	PRINT A
	Problem 2:-
	{ int i, j, k;
	for (i=0 ; i<=N ; i++)
	p[i] = 1;
	for (i=2 ; i<=N ; i++)
	{
	k = p[i]; j=1;
	while (a[p[j-1]] > a[k] {
	p[j] = p[j-1];
	j--;
	}
	p[j]=k;
	}
		Unit – 8

	Problem 3:-
	begin int x, y, power;
	float z;
	input(x, y);
	if(y<0)
	power = -y;
	else power = y;
	z=1;
	while(power!=0)
	{ z=z*x;
	power=power-1;
	} if(y<0)
	z=1/z;
	output(z);
	end	

29.	Perform version control using GIT(Or any other version control tool).	Unit – 10

Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)

L:	3	T:	0	P:	2

Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory	3	4	MCQ	50%	55
Theory			Theory Descriptive	35%	40
Theory			Formulas and Derivation	0%	0
Theory			Numerical	5%	5
Expected Theory %	**90%**		**Calculated Theory %**	**90%**	**100**
Practical	1		Individual Project	0%	0
Practical			Group Project	10%	100
Practical			Internal Practical Evaluation (IPE)	0%	0
Practical			Viva	0%	0
Practical			Seminar	0%	0
Expected Practical %	**10%**		**Calculated Practical %**	**10%**	**100**
Overall %	**100%**			**100%**	**200**

Course Outcome	
	Upon completion of the course students will be able to
CO1	To analyze and specify software requirements and apply various software process models to real-world software development scenarios, understanding their advantages and limitations.
CO2	To learn professional responsibilities associated with requirement analysis, function-oriented and object-oriented design techniques to develop structured and modular software solutions.
CO3	Able to develop comprehensive skills in managing software projects efficiently, including metrics application, estimation, scheduling, testing proficiency, and quality assurance understanding.
CO4	Able to develop comprehensive expertise in software testing, quality assurance, and change management, fostering a culture of continuous improvement.
Suggested Reference Books	
1	Software Engineering: A practitioner's approach (6 or 7th Edition), Roger S. Pressman, McGraw Hill.
2	Fundamentals of Software Engineering (4th Edition), Rajib Mall, Prentice Hall India.
3	Software Engineering, Ian Sommerville, Addision and Wesley

List of Open Source Software/Learning website	
1	https://www.javatpoint.com/
2	https://www.tutorialspoint.com/
3	https://www.guru99.com/
4	https://support.microsoft.com/en-us/office/beginner-tutorial-for-visio-bc1605de-d9f3-4c3a-970c-19876386047c
5	https://www.softwaretestingmaterial.com/manual-testing-tutorial/

Practical Project/Hands on Project

<table>
<tr><th>Sr. No.</th><th>Project List</th><th>Linked with Unit</th></tr>
<tr><td>1</td><td>Assume that you are Software Architect or Project Manager in organization. You have been assigned the task of constructing a website for a specific company with your team. Estimate project efforts, total development time and no of persons involved in your project using any one project estimation technique After completion of estimation as a project manager, would you quote the cost estimated using COCOMO as the price in your bid? Explain your answer.</td><td>Unit-6</td></tr>
<tr><td>2</td><td>The following table indicates the various tasks involved in completing a software project, the corresponding activities, and the estimated effort for each task in person-months.
<table>
<tr><th>Notation</th><th>Activity</th><th>Efforts</th></tr>
<tr><td>T1</td><td>Requirements specification</td><td>1</td></tr>
<tr><td>T2</td><td>Design</td><td>3</td></tr>
<tr><td>T3</td><td>Code actuator interface module</td><td>3</td></tr>
<tr><td>T4</td><td>Code sensor interface module</td><td>6</td></tr>
<tr><td>T5</td><td>Code user interface part</td><td>4</td></tr>
<tr><td>T6</td><td>Code control processing part</td><td>2</td></tr>
<tr><td>T7</td><td>Integrate and Test</td><td>7</td></tr>
<tr><td>T8</td><td>Write user manual</td><td>4</td></tr>
</table>
The precedence relation Ti ≤ {Tj, Tk} implies that the task Ti must complete before either task Tj or Tk can start. The following precedence relation is known to hold among different tasks: T1 ≤ T2 ≤ {T3, T4, T5, T6} ≤ T7.
(a) Draw the Activity network representation of the tasks.
(b) Determine ES, EF and LS, LF for every task.
(c) Develop the Gantt chart representations for the project.</td><td>Unit-6</td></tr>
<tr><td>3</td><td>Design the black-box test suite for the following Library Automation Software. The Library Automation Software accepts a string representing the enrollment no of a student. It checks the student’s account, and displays the details of book the student has issued. If the book is overdue then it displays the due date along with the fine to be paid.</td><td>Unit-8</td></tr>
<tr><td>4</td><td>Objective: To identify the various elicitation techniques and their usage for the Banking case study.
Background: Requirement elicitation is the process of seeking, discovering, acquiring and elaborating requirement. This includes learning and understanding the needs of the users. This activity is communication centric and iterative in the nature. The techniques used here are the important to get stack holder consensus on the requirements.
Problem Description:
KHL is a leading global bank that provides standard banking services to its customers spanning across the globe. The head office is located in London and the bank has presence in more than 20 countries with client base of nearly 500,000. Tuning with times and ever increasing clients and transactions, the bank has specialized branches for specific customer segments like consumer, corporate and the SME’s. KHL Bank aims to be one stop shop for its customers to address their changing financial needs. KHL bank offers various banking products and services across its customer segments including Core Banking and Wealth Management amongst other services. KHL Bank is well known among its clients for world-class processes and speed of execution of transactions as part of core banking. Currently, KHL bank has made a proposal for investing around $200 million in setting-up 24x7 banking support facilities for the customers. The bank has decided to leverage IT for automating several of the business processes including:
• Managing Accounts
• Transaction Management
The aim of this proposed banking system is to create a paperless bank there by moving towards e-banking. FinSoft, a newly established software company has the vision of providing software solutions in the financial sector. Managing Director (MD) of KHL bank has approached FinSoft for the computerization of the bank so that there is no more manual way of doing transactions in any of its branches. As part of automation, the KHL bank users are to be provided with ATM facility, e-banking facility over internet and phone banking facility over land lines and cellular networks. FinSoft is doing such a project for the first Time. Requirements development team in FinSoft has planned for carrying out the requirement elicitation for this project.
In the context of the case study, for the following scenarios identify the most appropriate requirements elicitation techniques (Brainstorming, Workshops, Questionnaire, Task Analysis, Observation, Prototyping, Scenario identification).</td><td>Unit-3</td></tr>
</table>

Scenario	Requirement elicitation technique
Interrogative conservation with Managers, Cashiers, Clerks and other Staff for arriving at the requirement for automating transactions.	
Formal and planned requirement discussion in a conference to room conducted among managers of diversified branched facilitate by anchor.	
Survey form circulated among the users (account holders) who visit the bank, to ease their interactions with bank	
Analysis for understanding mode of transactions- Checks, Cash, DD, MT, Gold, etc.	
Ethnographers deployed for understanding the users interactions with bank officials.	
UI design of e-banking portal, ATM, Computer Systems	
Understanding the process involved in each transaction like withdraw, deposit, fund transfer etc.	