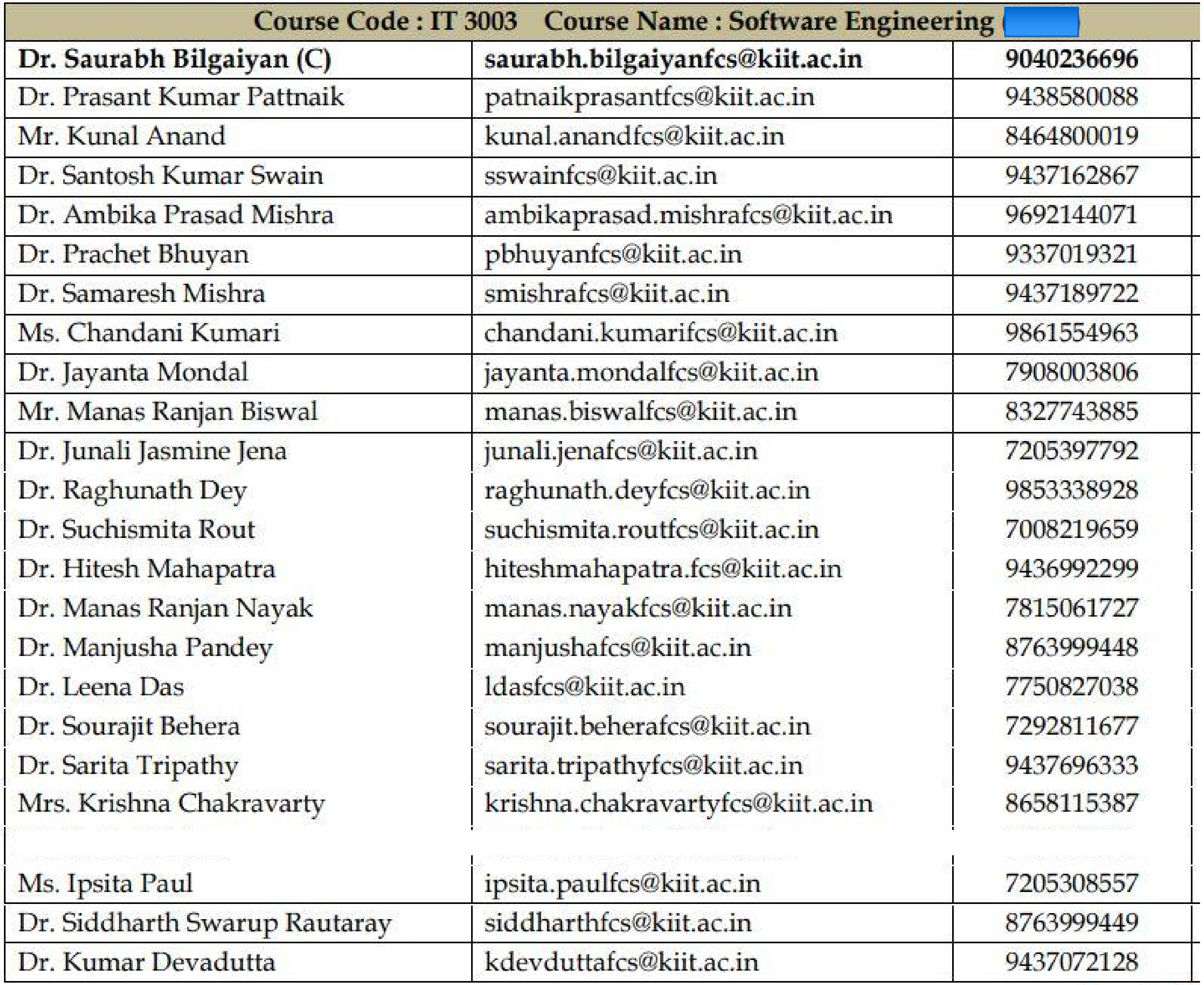
Software Engineering Lesson Plan
Autumn 5th Semester, 2023

School of Computer Engineering,
KIIT Deemed to be University
(Institute of Eminence)

Course Details

Program(s)	Academic Session, Semester	Subject Name	Subject Code	Credit
B.Tech [CSE,IT,CSSE,CSCE]	Autumn 2023 (July -December) 5th Sem	Software Engineering	IT-3003	4

Course Committee Faculties



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Text/Reference Books

Text Books

1. Fundamentals of Software Engineering, Rajib Mall , PHI, Latest edition.

2. Software Engineering, A Practitioner’s Approach, Roger S. Pressman ,TMG Hill, Latest edition.

Reference Book

1.Software Engineering, I. Sommerville, Pearson Education, Asia.

Syllabus

Software Process Models	Software product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities. Process Models: Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, RAD model. Agile models: Extreme programming and Scrum.
Software Project Management	Responsibilities of a Software project manager, project planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, COCOMO models, Scheduling, Organization & team structure, Staffing,.
Software Requirement Engineering	Requirement Gathering and analysis, Functional and non functional requirements, Software Requirement Specification(SRS) , IEEE 830 guidelines, Decision tables and trees.
Structural Analysis & Design	Overview of design process : High level and detailed design, Cohesion & coupling, Modularity and layering, Function–Oriented software design: Structural Analysis, Structural Design (DFD and Structured Chart), Object Oriented Analysis & Design
Testing Strategies	Coding, Code Review, Documentation, Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, Coverage analysis, Debugging, Integration testing, System testing, Regression testing.
Software Reliability **Software Maintenance**	Software reliability, reliability measures, reliability growth modelling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software re engineering, Software reuse
Emerging Topics	Client-Server Software engineering, Service Oriented Architecture (SOA), Software as a Service (SaaS)

Course Outcomes

	Course Outcomes	Modules	Blooms-taxonomy
CO1	Differentiate different software process models and understand their applicability in real life projects	• Software Process Models	• Level-1,2,3,4
CO2	Gather and specify requirements of the software projects	• Software Requirement Engineering	• Level-3
CO3	Apply the basic project management practices in real life projects	• Software Project Management	• Level-3
CO4	Translate the baseline requirement specifications into design & development process	• Structural Analysis & Design	• Level-6
CO5	Distinguish and apply different testing methodologies	• Testing Strategies	• Level-4
CO6	Evaluate different software metrics	• Application of overall knowledge gained • Software Reliability and Software Maintenance • Emerging Topics	• Level-5

Lesson Plan

Modules	Lecture Days	Topics/Coverage
1. Introduction & Software process models (10 hrs)	1st to 3rd	Software product, Software crisis, Exploratory Style of Software Development, Emergence of Software Engineering, Handling complexity through Abstraction and Decomposition, software development activities.
	4th to 9th	Software process Models: Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, RAD model. Essential Idea behind Agile Models, Agile models: Extreme programming and Scrum, Agile versus Other Models.
	10th	***Module 1 Activities***
2. Software Project Management (10hrs)	11th to 13th	Software Project Management Complexities, Responsibilities of a Software project manager, project planning, Metrics for project size estimation,
	14th to 15th	Project cost estimation techniques (Empirical estimation techniques, COCOMO models)
	16th to 18th	Scheduling (Work Breakdown Structure, Activity Networks, Critical Path Method (CPM), PERT Charts, Gantt Charts), Risk Management
	19th	Organization & team structure, Software Configuration Management
	20nd	***Module 2 Activities***

Lesson Plan

Modules	Lecture Days	Topics/Coverage
4. Structural Analysis & Design (7 Hrs)	24th to 26th	Overview of the Design Process, How to Characterise a Good Software Design?, Approaches to Software Design, High level and detailed design, Cohesion & coupling, Modularity and layering, Function–Oriented software design: Structural Analysis, Structural Design (DFD and Structured Chart),
	27nd 29th	Object Oriented Analysis & Design (Basic Object-Orientation Concepts, Use case diagram, Class diagram, State chart diagram), Command language, menu and iconic interfaces.
	30th	***Module 4 Activities***
5.Testing Strategies (10 Hrs)	31st, 32nd	Coding, Code Review, Code Inspection, Documentation
	33nd to 35th	Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, Coverage analysis
	36th to 39th	Debugging, Integration testing, System testing.`
	40th	***Module 5 Activities***
6.Software Reliability and Software Maintenance (6 Hrs)	41th to 43h	Software reliability, reliability measures, reliability growth modelling, Quality SEI CMM,
	44rd to 46th	Characteristics of software maintenance, software reverse engineering, software re-engineering. Software Reuse

Activities

- Software Engineering is one of the key subjects which can create the practical knowledge base for the students and make them ready for future engagements/ placements.

- Keeping this is in mind, along with regular academic assessments, this course aims to enable students to take baby steps by exercising the existing approaches on existing/available popular projects to prepare themselves towards their B.Tech projects in coming semesters.

Group Project as Activity

- Students will perform all stages of software development cycle like
  - **Requirement Analysis**
  - **Design, Design diagrams (UML)**
  - **Coding Plan. Coding can be implemented in 6th sem project**
  - **Test Plan, Test Scripts**
- A group report will be prepared consisting of all above.
- The group will present their work at the end.
- **The best outcome of this approach will be, students will have proper documented B.Tech projects (which is lacking today) , hence this will benefit students in a great way.**
- **At last, Students will be forming groups and will conceptualize projects (Real world hands on projects attached as additional list) which they can implement in 6th sem minor and 8th sem major projects.**
- In 6th sem minor project and 8th sem major projects, the Software Engineering Faculty can continue provide assistance.

Activities

Group formation (For this Semester)

- In the beginning of session, students may be divided into groups (8 to 10 members)

Real world project prototypes

- Right after the group formation, Students will be asked to participate in prototype projects in different domains in real world.
- After every module, they will be preparing the relevant and necessary diagrams/documents/ code/algorithm/test plan as required as part of activity deliverables.

Focus areas have been identified as

- **Real world problem identification & solution approach.**
- **Analyzing the probable solution.**
- **Critical thinking**
- **Creation of design**
- **Interactivity Focus**
- **Reflection**

- **Activities have been identified in every module.**
- **Different focus areas have been identified as applicable across all modules.**

Activity Projects

Example prototype from Real world domains identified as (one of the project to be selected by each group)

No	Systems to study	Reference/Examples
1	Railway reservation system	https://www.irctc.co.in
2	Online Banking system	https://www.icicibank.com/
3	Online shopping sites	www.amazon.in/Home
4	School website	http://kiit-is.org/
5	University website	http://kiit.ac.in/
6	Online Bill payment system	https://www.odishaonline.gov.in/site/Common_Quick_Pay.aspx
7	Online hotel booking system	https://www.trivago.in/
8 9 10	Online Grocery store sites Hospital Management and Monitoring Health Monitoring System	www.bigbasket.com/

The basic process flow of these systems will be captured and understood.

Time-lines for Group Project

Steps	Details	Time-line
1	Students will form groups, from the same sections.	
2	Students will propose a concept of software project	
3	Write Requirement analysis, prepare report	During **Software Requirement Engineering** module
	MID REVIEW	**After Mid Sem**
4	Draw UML diagrams (basics), add in report	During **Structural Analysis & Design** module
5	Create dummy screens/wireframe, if required	
6	Create test plans and test scripts as per requirements	During **Testing** module
	END REVIEW **Group presentation + report**	**Before end sem**

Module wise Activity - 1

Module 1 : **Software Process Models**

Focus Areas	Learning Practices	List of Activities	Marks	Tangible Output	Mapping CO
Understanding	Assignment	1. Identify criteria based on which a suitable life cycle model can be chosen by you (out of given software development projects in prev. page). Illustrate with diagrams. 2. Explain the important features of agile software model. Compare the advantages and disadvantages with iterative waterfall and exploratory programming.	5	Assignment	CO1
Interactivity Focus	Group discussion	1. Discuss pros and cons of different models	5	Discussion	CO1

Total Marks = 10

Module wise Activity - 3

Module 2 : **Software Project Management**

Focus Areas	**Learning Practices**	**List of Activities**	**Marks**	**Tangible Output**	**Mapping CO**
Problem Solving	Group Report	*Refer the real world project, slide 12* 1. Estimate size of the prototype selected. 2. Create schedule, cost estimation and resource plan for a project prototype	5	1. Schedule and resource plan sheet. 2. Size & Cost calculation in report form	CO3
Quiz	Quiz	Including modules 1, 2, 3.	5	Quiz	CO3

Total Marks = 10

Module wise Activity - 2

Module 3 : **Software Requirement Engineering**

Focus Areas	Learning Practices	List of Activities	Marks	Tangible Output	Mapping CO
Critical thinking	Group Report	*Refer the real world project, slide 12* 1. Study, analyse and prepare report on system requirements of any one module of the real world systems (mentioned in slide 10).	5	Well documented SRS document.	CO2
Problem Solving	Assignments	1. What is traceability in SRS context ? How is traceability achieved in the above mentioned modules? explain with examples. 2. Make a check-list of various types of errors that might exist in an SRS doc.	5	Assignments	CO2

Total Marks = 10

Module wise Activity - 4

Module 4 : **Structural Analysis & Design**

Focus Areas	Learning Practices	List of Activities	Marks	Tangible Output	Mapping CO
Creation	Group Report	*Refer the real world project, slide 12* 1. Create UML diagrams, DFD from SRS 2. Construct the Data Dictionary	5	Diagrams in report	CO4
Critical thinking	Assignment	Algorithm / pseudo code for one important module	5	Algorithm / pseudo code	CO4

Total Marks = 10

Module wise Activity - 5

Module 5 : **Testing Strategies**

Focus Areas	**Learning Practices**	**List of Activities**	**Marks**	**Tangible Output**	**Mapping CO**
Creation	Group Report	*Refer the real world project, slide 12* Create dummy screens/wireframe, if required	4	Code with screens in report	CO5
Analyzing + Problem solving	Assignment	*Refer the real world project, slide 12* 1. Create test plan (unit, integration, system, user acceptance) 2. Create test scripts for one module	3	Test scripts	CO5
Analyzing	research paper	Study research papers in latest software testing trends, example https://ieeexplore.ieee.org/document/7476770/	3	Assignment	CO5

Total Marks = 10

Module wise Activity - 6

Module 6 : **Software Reliability , Software Maintenance and Emerging Topics**

Focus Areas	**Learning Practices**	**List of Activities**	**Marks**	**Tangible Output**	**Mapping CO**
Analyzing	Assignment	1. Define three metrics to measure software reliability for your project. Please justify your answers if these metrics are satisfactory enough. 2. What are the advantages of client-server software? Explain SOA and SaaS with diagrams	5	Assignment	CO6
Quiz	Quiz	Including modules 4, 5, 6. Gate questions will be there on these modules	5	Assignment	CO6

Total Marks = 10

Activity marks distribution

Modules		Marks
1	Software Process Models	10
2	Software Project Management + Quiz	10
3	Software Requirement Engineering	10
4	Structural Analysis & Design	10
5	Testing Strategies + research	10
6	Software Reliability, Software Maintenance and Emerging Topics + Quiz	10
	Total	60
	Convert the total mark to activity mark 30	

Evaluation Scheme

EXAM		MARKS
End Semester		50
Internal	Mid Semester	20
	Activities	30
Total		**100**

Please note marks obtained in activities (out of 60) will be scaled down to 30.

Program Educational Objectives

- PEO-1. To lead a successful career in industries or pursue higher studies or entrepreneurial endeavours.
- PEO-1. To offer techno-commercially feasible and socially acceptable solutions to real life engineering problems.
- PEO-1. To demonstrate effective communication skill, professional attitude and a desire to learn.

Program Outcomes

a)Ability to apply knowledge of mathematics, science, engineering, computing to solve complex problems.

b)Ability to identify, analyse and solve complex software and hardware engineering problems.

c)Ability to design, implement and evaluate various computer based systems to meet the needs of the society by considering public health, safety, cultural, societal and environmental issues.

d)Ability to design & conduct experiments and interpret data.

e)Ability to use techniques, skills and modern engineering and IT tools to various relevant engineering practices.

f)Ability to examine and understand the impact of societal, health, safety, legal and cultural concerns at local, national and international levels relevant to engineering practices.

g)Ability to recognize the sustainability and environmental impact of the computer-based engineering solutions.

h)Ability to follow prescribed norms, responsibilities and ethics in engineering practices.

i)Ability to work effectively as an individual and in a team.

j)Ability to communicate effectively through oral, written and pictorial means with engineering community and the society at large.

k)Ability to recognize the need for and to engage in life-long learning.

l)Ability to understand and apply engineering & management principles in executing projects.