SOFTWARE PROCESS AND PROJECT MANAGEMENT (CS725PE)
COURSE PLANNER

I.COURSE PURPOSE:

At the end of the course the student should be in a position to
1.Describe Principles of Software Process Change.
2.Explain Software Life-Cycle Phases and Process artifacts
3 Describe Project Control and process instrumentation.
4.Analyze Next-Generation software Economics.

II.PRE-REQUISITES:

It's expected to have basis knowledge of software engineering and different process and data models and their applications.

III. COURSE OBJECTIVIES:

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development.
3. To understand software economics

IV.COURSE OUTCOMES:

S. No.	Course Outcomes	Bloom's Taxonomy Lavels
1.	Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation	L2:Understand
2.	Analyze the major and minor milestones, artifacts and metrics from management and technical perspective	L2:Understand
3.	Design and develop software product using conventional and modern principles of software project management	L3:Analyzing

V.HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (PO)		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems related to Computer Science and Engineering.	2.6	Mini Projects
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems related to Computer Science and Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	1.4	Lectures, Assignments, Exams
PO3	**Design/development of solutions**: Design solutions for complex engineering problems related to Computer Science and Engineering and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and	2.4	Mini Projects

Program Outcomes (PO)		Level	Proficiency assessed by
	environmental considerations.		
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	--
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	-	--
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Computer Science and Engineering professional engineering practice.	-	--
PO7	**Environment and sustainability**: Understand the impact of the Computer Science and Engineering professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	Lectures, Assignments, Exams
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	-	
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	-	Mini Projects
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	-	--
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	2.2	Lectures, Assignments, Exams
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2.2	Lectures, Assignments, Exams

VI.HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSO)		Level	Proficiency assessed by
PSO1	**Foundation of mathematical concepts:** To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable algorithm.	2.4	Mini Project
PSO2	**Foundation of Computer System:** The ability to interpret the fundamental concepts and methodology of computer systems. Students can understand the functionality of hardware and software aspects of computer systems.	2.6	Lectures, Assignments, Exams
PSO3	**Foundations of Software development:** The ability to grasp the software development lifecycle and methodologies of software systems. Possess competent skills and knowledge of software design process. Familiarity and practical proficiency with a broad area of programming concepts and provide new ideas and innovations towards research.	2	Mini Project

VII. SYLLABUS:

UNIT – I

Software Process Maturity Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT – II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT – III

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT – IV

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT – V

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

GATE SYLLABUS

NA

VIII. LESSON PLAN:

Lecture No	Unit No.	Topics to be covered	Link for PPT	Link for PDF	Link for Small Projects/ Numericals(if any)	Course learning outcomes	Teaching Methodology	Reference
1	I	* Intoduction to SPPM -Software Process Maturity	https://docs.google.com/document/d/19eema-D0q28lt4hm-8HCJwooaMzxhZBY/edit?usp=sharing&ouid=115992674382595689987&rtpof=true&sd=true	https://docs.google.com/document/d/19eema-D0q28lt4hm-8HCJwooaMzxhZBY/edit?usp=sharing&ouid=115992674382595689987&rtpof=true&sd=true	NA	CLO 1	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	T1
2		Software maturity Framework- Principles of Software Process Change				CLO 1		T1
3		Software Process Assessment -The Initial Process				CLO 1		T1
4		The Repeatable Process- The Defined Process				CLO 1		T1
5		The Managed Process				CLO 1		T1
6		The Optimizing Process				CLO 1		T1
7		Process Reference Models - Capability Maturity Model (CMM),				CLO 1		T1
8		CMMI,PCMM,PSP,TSP				CLO 1		T1
9		***Mock Test#1***						
10		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
11	II	Software Project Management Renaissance- Conventional Software Management			*NA*	CLO 3	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	T2
12		Evolution of Software Economics,				CLO 1		T2
13		Improving Software Economics				CLO 1		T2

14		The old way and the new way				CLO 1		T2
15		Life-Cycle Phases and Process artifacts Engineering and Production stages				CLO 1		T2
16		inception phase, elaboration phase				CLO 1		T2
17		construction phase, transition phase,				CLO 1		T2
18		artifact sets-management artifacts				CLO 1		T2
19		engineering artifacts and pragmatic artifacts				CLO 1		T2
20		model-based software architectures				CLO 1		T2
21		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
22		Workflows and Checkpoints of process - Software process workflows				CLO 2	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	T2
23		Iteration workflows,Major milestones			***NA***	CLO 2		T2
24		minor milestones, periodic status assessments				CLO 2		T2
25	**III**	Process Planning - Work breakdown structures,				CLO 3	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	T2
26		Planning guidelines, cost and schedule estimating process			***NA***	CLO 3		T2
27		iteration planning process, Pragmatic planning.				CLO 3		T2
28		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						

29	I V	Project Organizations Line-of- business organizations,			***NA***	CLO 1	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	**T2**
30		project organizations, evolution of organizations,				CLO 1		**T2**
31		process automation				CLO 1		**T2**
32		Project Control and process instrumentation				CLO 1		**T2**
33		The seven-core metrics, management indicators				CLO 2		**T2**
34		quality indicators, life-cycle expectations,				CLO 2		**T2**
35		Pragmatic software metrics, metrics automation.				CLO 2		**T2**
36		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
37		***Mock Test#2***						
38	V	CCPDS-R Case Study			***NA***	CLO 3	• Chalk & Talk • LCD / PPT • Assignments • Videos (NPTEL)	**T2**
39		Future Software Project Management Practices				CLO 3		**T2**
40		Modern Project Profiles,				CLO 3		**T2**
41		Next-Generation software Economics				CLO 3		**T2**
42		Modern Process Transitions				CLO 3		**T2**
43		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
44		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
45		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
46		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						
47		***Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation***						

48		*Tutorial Class(Bridge Class/ Revision Class)/ Student Presentation*

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCES:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000 Process Improvement essentials, James R. Persse, O'Reilly, 2006
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
3. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
4. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
5. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2 nd edition, Wiley India, 2004.
6. Agile Project Management, Jim Highsmith, Pearson education, 2004..

IX.MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	-	-	-	-	-	-	2	3	2	3	2
2	2	2	3	2	-	-	-	-	-	-	3	3	3	2	2
3	3	1	2	2	-	-	-	-	-	-	3	2	2	3	2
AVG	**2.6**	**1.4**	**2.3**	**2**	-	-	-	-	-	-	**2.6**	**2.6**	**2.4**	**2.6**	**2**

DESCRIPTIVE QUESTIONS

UNIT-1

Short Answer Questions

QUESTIONS	Blooms taxonomy level
1.Explain Principles of Software Process Change?.	Understand
2.Describe about Software Process Assessment?.	Understand
3.Define Initial Process?.	Knowledge
4.Describe about Repeatable Process?.	Knowledge
5. Explain about Managed Process?.	Knowledge
6.Define Optimizing Process?.	Knowledge

Long Answer Questions

1. Distinguish between software process and software project	Understand
2. Discuss in detail the Initial process, the repeatable process and the managed process.?.	Understand
3. What are process reference models? Explain any two of them.?.	Knowledge
4.Explain about the Optimizing Process in details?.	Understand
5.Explain about the PCMM Process Reference Model in details?.	Knowledge

UNIT-2

Short Answer Questions

QUESTIONS	Blooms taxonomy level
1.Explain about the Evolution of Software Economics?.	Knowledge
2.Describe about Life-Cycle Phases?.	Knowledge
3. Describe about inception phase?.	Knowledge
4.Explain about elaboration phase ?.	Knowledge
5. Describe about transition phase?.	Knowledge
6.Define management artifacts?.	Knowledge

Long Answer Questions

1. Explain the risk profile of a conventional software project across its life cycle.?.	Knowledge
2. What is meant by Elaboration phase? Discuss the primary objectives and essential activities of Elaboration phase?.	Understand
3. Discuss briefly the Engineering artifact sets?.	Understand
4. Explain with a neat diagram how various artifacts evolved over the life cycle?.	Understand
5. Explain the pragmatic software metrics?	Understand

UNIT-3

Short Answer Questions

QUESTIONS	Blooms taxonomy level
1.Explain about Iteration workflows?.	Understand
2. Describe about Major milestones?.	Apply
3. Describe about Minor milestones?.	Knowledge
4.Explain congestion control?.	Understand
5. Describe abour Work breakdown structures?.	Knowledge
6. Define Pragmatic planning?.	Knowledge

Long Answer Questions

1. What are major milestone that occur at the transition points between life - cycle phases? Explain them?	Understand
2. Discuss about typical minor milestones in the life cycle of an iteration?.	Knowledg
3.Explain in detail about periodic status assessments	Understand
4.Explain about iteration planning process?.	Understand
5.Describe about Process Planning in details?.	Understand

UNIT-4

Short Answer Questions

QUESTIONS	Blooms taxonomy level
1. Explain about evolution of organizations?.	Knowledge
2. Describe about process automation?.	Knowledge
3.Define about core metrics?.	Knowledge
4.Explain about management indicators?.	Understand
5.Describe about life-cycle expectations?.	Understand

Long Answer Questions

1. What are the key practices that improve overall software quality?.	Understand
2. Describe about Pragmatic software metrics?.	Knowledg
3.Illustrate the congestion control in details?.	Understand
4.Explain in detail about metrics automation?.	Understand
5.Explain Project Control and process instrumentation in detail?.	Understand

UNIT-5

Short Answer Questions

QUESTIONS	**Blooms taxonomy level**
1.State advantages Next-Generation software Economics?.	Knowledge
2. Explain about Modern Process Transitions?.	APPLY
3. Describe about Future Software Project Management Practices?.	Knowledge
4. Describe the CCPDS-R Case Study?.	Understand
5.Define Modern Project Profiles?.	Understand

Long Answer Questions

1. Discuss clearly the software management team activities, software architecture team activities also software development team activities?	Understand
2. Write short notes on the Next – Generation software economics ?	Understand
3. Write short notes on the Modern process transitions?	Understand
4.Explain in details about Modern Project Profiles?.	Understand
5.Discues about CCPDS-R Case Study?.	Understand

UNIT-1

1. Capability level in which process area is either not performed or doesn't achieve all goals and objectives defined by CMMI respective level
   a.**Level0:incomplete** b.Level0:complete c. Level1:Performed d. Level2:Managed
2. Process area in which organizational innovation and deployment casual analysis and resolution is present has level of
   a.**Optimizing** b. defined c. managed d. performed
3. In PSP, component level design is refined and reviewed by
   a. postmortem b. planning c. high level design d. **Development**
4. Which of the following is not a maturity level in CMM
   b. Design b) Repeatable c) **Managed** d) Optimizing
5. TSP recognizes that best software teams are
   a. user-directed b. manager-directed c. engineer-directed d. self-directed

6. AOSD stands for_____ **Answer:Aspect Oriented Software Development**
7. Framework that encompasses a process, set of methods and an array of tools is termed as_____ **Answer: software engineering**
8. According to ISO 9001, the causes of nonconforming product should be **eliminated and identified**
9. At higher recovery _____ distillate is produced. **Answer: More**
10. COTS stands for_____ **Answer: Commercial off-the-shelf**

UNIT-2

1. Quality planning is the process of developing a quality plan for
   a) Team **b) project** c) customers d) project manager

2. Which of the following is incorrect activity for the configuration management of a software system?

a) Internship management b) Change management c) Version management d) System

3. An independent relationship must exist between the attribute that can be measured and the external quality attribute.

a)True **b) False**

4. Which one of the following models is not suitable for accommodating any change?

a) Build & Fix Model b) Prototyping Model c) RAD Model **d) Waterfall Model**

5. Which model can be selected if user is involved in all the phases of SDLC?

a)Waterfall Model b) Prototyping Model **c) RAD Model** d) both B &C

6. A 66.6% risk is considered as **High**

7.SDLC stands for **Software Development Life Cycle**

8. RAD stands for **Rapid Application Development**

9.Build & Fix Model is suitable for programming exercises of **100-200** LOC (Line of Code).

10.RAD Model has **5 phases**

UNIT-3

1. Which of the following are parameters involved in computing the total cost of a software development project?

a)Hardware and software costs b) Effort costs

c) Travel and training costs **d) All of the mentioned**

2.Which of the following costs is not part of the total effort cost?

a)Costs of networking and communications b) Costs of providing heating and lighting office space

c) Costs of lunch time food d) Costs of support staff

3.What is related to the overall functionality of the delivered software?

a)Function-related c)size related metrics

b) Product-related metrics d) None of the mentioned

4.It is often difficult to estimate size at an early stage in a project when only a specification is available

a)True b) False

5.Which model is used to compute the effort required to integrate reusable components or program code that is automatically generated by design or program translation tools?

a) An application-composition model b) A post-architecture model

c) A reuse model d) An early design model

6. A Algorithmic **cost modeling** is developed using historical cost information that relates some software metric to the project cost.

7.A **Algorithmic cost modeling** is developed using historical cost information that relates some software metric to the project cost.

8**. Function-related metrics** related to the overall functionality of the delivered software?

9**. Estimation by analogy t**echnique is applicable when other projects in the same analogy application domain have been completed?

10**. Parkinson's Law** states that work expands to fill the time available

UNIT-4

1.Which of the following is not considered as a risk in project management?

a) Specification delays b) Product competition **c) Testing** d) Staff turnover

2.The process each manager follows during the life of a project is known as

a) Project Management b) Manager life cycle

c) Project Management Life Cycle d) All of the mentioned

3.Inspections and testing are what kinds of Quality Costs?

a) Prevention b) Internal Failure c) External Failure **d) Appraisal**

4Which of the following is not a core step of Six Sigma?

a) Define **b) Control** c) Measure d) Analyse

5.Software safety is equivalent to software reliability.

a) True **b) False**

6. **testing tools** examine program systematically & automatically

7. **Test Archiving Systems** testing tool is responsible for documenting programs

8.Beta Testing is done by **Users**

9.Execution Verifier is a dynamic tool that is also known as **Coverage Analyzer**

10.Percentage of modules that were inspected is a part of **Process Metrics**

UNIT-5

1. Standard Enforcer is a

   a)Static b) Dynamic Testing

   c) Static & Dynamic Testing d) None of the mentioned

2. Which testing tool does a simple job of enforcing standards in a uniform way of many programs?

   a) Static Analyzer b) Code Inspector

   c) Standard Enforcer **d) Both Code Inspector & Standard Enforcer**

3. Which metric gives the idea about the contents on a web page ?

   a) Word Token **b) Word Count** c) Word Size d) Word Length

4. Which of the following is not a classification of the web engineering metric, Web Page Similarity ?

   a) Content based b) Link based c) Usage based **d) Traffic based**

5. Which of the following is not a web engineering project metric ?

   a) Number of Static Content Objects b) Number of Dynamic Content Objects

   c) Number of Inherited Objects d) Word Count

6. Link based measures rely on **Hyperlink** structure of a web graph to obtain related pages
7. Reverse engineering is the process of deriving the system design and specification from its **Source code**
8. Transformation of a system from one representational form to another is known as **Re-factoring and Restructuring**
9. Extracting data items and objects, to get information on data flow, and to understand the existing data structures that have been implemented is sometimes called **data analysis**
10. Software mistakes during coding are known as **Bugs**

XI.WEBSITES:

1.https://www.softwareengineeringdaily.com /

2. https://www.reddit.com/r/SoftwareEngineering/
3. https://www.toptal.com/blog
4. http://blog.wolksoftware.com/

XII.JOURNALS:

1.International Journal of software engineering ,technology and applications

2.Journal of Software:Evolution and Process

XIII.Experts in the subject:

1.. Prof. Rajib Mall ,IIT Kharagpur,Computer Science and Engineering,Head, Centre for Educational Technology,Email:- rajib@cse.iitkgp.ac.in

2. Prof. Durga Prasad Mohapatra , Email:- durga@nitrkl.ac.in

XIV.LIST OF THE SEMINAR TOPICS:

1. Optimizing Process
2. Repeatable Process
3. CMMI
4. CMM
5. Evolution of Software Economics
6. Life-Cycle Phases and Process artifacts.
7. Major milestones, minor milestones

XV CASE STUDIES / SMALL PROJECTS

1. Game forge

2.Waste management Inspection Tracking system

3.Multimedia Content Management System