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**UNIVERSITY OF PETROLEUM & ENERGY STUDIES**

**School of Computer Science**

**Dehradun**

**COURSE PLAN**

Programme : B. Tech. CSE spl. Devops

Course :Software Engineering and Project Management

Subject Code : CSEG2008

No. of credits : 3

Semester : IV

Session : Jan 2019 – May 2019

Batch : 2017 - 2021

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**Approved By**

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**COURSE PLAN**

1. **PRE-REQUISITES**

Basic knowledge of Project, System Design and management.

1. **PROGRAM OUTCOMES (POs) and PROGRAM SPECIFIC OUTCOMES for B.Tech. CSE DevOps**

**B1. PROGRAM OUTCOMES (POs)**

1. *Engineering knowledge:* Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. *Problem analysis:* Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. *Design/development of solutions:* Design solutions for complex engineering problems 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 environmental considerations.
4. *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.
5. *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.
6. *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 professional engineering practice.
7. *Environment and sustainability:* Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. *Ethics:* Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. *Individual and team-work:* Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. *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.
11. *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.
12. *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.

**B2. PROGRAM SPECIFIC OUTCOMES (PSOs)**

1. Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques.
2. Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.

PSO3. Understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business oriented environment with optimized performance tuning and data reliability.

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1. **COURSE OBJECTIVES**
2. Gain a good understanding of the software engineering framework and the software engineering process models applied to various categories of software projects as well as analyse the scope and pros & cons of each model.
3. Understand the Software Requirements Engineering Process, the importance and structure of SRS, Software Design Concepts and design the Use case diagram, Data Flow Diagram for any automated real-world existing system
4. Acquire a good understanding of planning a software project on the basis of Cost using Cost estimation models, understand the Software Quality models and schedule the software projects.
5. Gain a good understanding of the testing techniques and strategies deployed as well as the types of risks in Software Projects, their analysis and how to mitigate them .
6. Understand the concept of Project Management, Product vs. Project lifecycle, cost-benefit analysis of projects, project selection models, issues in managing projects and gain knowledge of the role and responsibilities of Project Managers
7. **COURSE OUTCOMES (COs), Mapping with POs and PSOs**

Upon completion of this course the learners will be able to:

CO1. Understand various software process models such as waterfall, Spiral and evolutionary models.

CO2. Demonstrate effective teamwork and strong working knowledge of ethics and professional responsibility for managing the software projects.

CO3. Demonstrate effective project execution, quality control and risk management techniques that result in successful projects.

CO4. Conduct project planning activities that accurately forecast project costs, timelines and quality.

CO5. Conduct standard tests and measurements for validation of projects; to conduct, analyze, and interpret results; and to apply results to improve processes.

**Table: Mapping of COs with POs and PSOs**

|  |  |  |
| --- | --- | --- |
| **Course Outcomes (COs)** | | **Mapped PO & PSO** |
| CO1 | Understand various software process models such as waterfall, Spiral and evolutionary models. | PO1, PO3, PO4, PO12, PSO1 |
| CO2 | Demonstrate effective teamwork and strong working knowledge of ethics and professional responsibility for managing the software projects. | PO2, PO3, PSO1,PSO2,PSO3 |
| CO3 | Demonstrate effective project execution, quality control and risk management techniques that result in successful projects. | PO10, PSO1,PSO2,PSO3 |
| CO4 | Conduct project planning activities that accurately forecast project costs, timelines and quality. | PSO2,PSO3 |
| CO5 | Conduct standard tests and measurements for validation of projects; to conduct, analyze, and interpret results; and to apply results to improve processes. | PSO1,PSO2,PSO3 |

**Table: Correlation of the Course with the POs and PSOs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course  Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 |  | 1 | 2 | 2 |  |  |  |  |  |  |  |  | 1 | 3 |  |
| CO2 |  |  |  |  |  |  |  | 2 | 2 |  |  |  | 2 | 3 |  |
| CO3 |  |  |  |  |  |  |  |  |  | 2 |  |  | 2 | 3 |  |
| CO4 |  |  |  |  | 2 |  |  |  |  |  |  |  | 2 | 2 |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  | 2 | 2 | 1 |

1=weakly mapped 2= moderately mapped 3=strongly mapped

1. **COURSE OUTLINE**

|  |  |
| --- | --- |
| **Module** | **Contents** |
| 1 | **UNIT- 1: Introduction to Software Engineering** |
| 2 | **UNIT- 2: Requirement Analysis and Specifications** |
| 3 | **UNIT- 3: Software Project Planning** |
| 4 | **UNIT -4: Software Metrics** |
| 5 | **UNIT- 5: Software Testing** |
| 6 | **UNIT-6: Project Quality and Risk Management** |
| 7 | **UNIT-7: Project Integration and Scope Management** |

1. **PEDAGOGY**

* Presentations
* Flipped Classroom sessions
* Think-Pair-Share Activities
* Video Lectures
* Class Test
* Quiz
* Assignments
* Digital and analog Presentations
* Concept diary (needs to be maintained by students-short and concise notes which include course concepts that he/she has understood.)

1. **COURSE COMPLETION PLAN**

|  |  |
| --- | --- |
| **Total Sessions** | 36 (F2F: 24, Online: 12) |
| **Total Quizz** | 02 |
| **Total Tests** | 02 |
| **Total Assignments/Project** | 02 |

One Session = 60 minutes

1. **EVALUATION & GRADING**

The components of the instructor-led continuous evaluation system will be as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No.** | **Assessment** | **Weightage** | **Schedule** |
| 1 | Internal Assessment (IA) | 30% | Detailed Below |
| 2 | Mid-semester Examination (MS) | 20% | Academic Calendar |
| 3 | End-semester Examination (ES) | 50% | Academic Calendar |
| Total | | 100% |  |

Each Assessment is carried out for suitable marks and finally reduced suitably based on its weightage. It is mandatory for all the students to undergo the process of continuous evaluation. The overall marks obtained at the end of the semester comprising the above three shall be converted to a grade.

1. **Internal Assessment:**

Internal Assessment shall be done based on the following detailed breakup and scheme of assessment:

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Description** | **% of Weightage** |
| 1 | Individual Assignments & Problems/Presentations | 30% |
| 2 | Class Tests/ Quiz | 50% |
| 3 | General Discipline, Faculty Assessment, Attendance | 20% |
|  | **Total** | **100** |

The marks awarded for the Online Internal Assessments will be available in Black Board and displayed to the students.

1. **Mid-semester Examination:**

Mid-semester examination will cover approximately half of the entire course content and shall be of two hours duration. The question paper pattern would be discussed well in advance before the exam. The evaluated answer sheets of the written exam shall be disclosed to the students ten days after the examinations.

1. **End-semester Examination:**

End-semester examination will cover the entire course content and shall be of three hours duration. The examination shall have short answer type questions, analytical and conceptual comprehension through essay/descriptive type questions, and cases or problem solving exercises. The evaluated answer sheets shall be disclosed to the students ten days after the examinations.

**GRADING:**

At course completion, the student is awarded with a grade (on a 10-point scale) based on the composite score (30% IA + 20% MS + 50% ES) obtained out of 100 marks. Students scoring less than 35 absolute marks in individual course either in End semester examination or as composite score shall be awarded a ‘F’ grade. Students scoring 85 marks and above as composite score shall be awarded a ‘O’ grade. The minimum individual course grade is ‘C’.

Students not meeting the individual course criteria or SGPA criteria (NC) should register for the Supplementary Examination (SE) by paying the prescribed fee per subject as notified by the University. For improving the grades (in case of NC) the student needs to opt for such courses in which the grade is less than ‘A’.

The student who is debarred due to shortage of attendance or with Grade ‘F’ for a course will need to register for Summer School during summer vacation (June-July) by paying the prescribed fee per subject as notified by the University and repeat continuous internal evaluation (IA) of the respective subject(s). The grade is awarded based on the composite score (30% IA + 70% SE) and capping (grade ‘A’, 8.0 in a 10-point scale). All other rules and regulations such as requirement of passing, etc. will remain same as mentioned above.

1. **DETAILED SESSION PLAN**

Note: The Online Sessions are highlighted in yellow color.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SESS-ION** | **TOPIC** | **Course Outcomes Addressed** | **Required Learning Resources**  **(including media)** | **Discussion(s) and  Postings on Frontier** | **Assignment/ Quizzes/ Tests** |
|  | **UNIT 1 : Introduction to Software Engineering** |  | **Books:**  1. *Aggarwal, K. K. & Singh, Yogesh (2008). Software Engineering. New Age International Publishers*.  Note: Learning resources have been written for first few lecture only. For remaining lectures the same may be added accordingly. |  |  |
| **L1** | Software Engineering definition; S/W characteristics, applications |  |
| **L2** | Life Cycle Models – Waterfall (classical and iterative) |  |
| **L3** | Spiral Model with quadrants and its scope |  |
| **L4** | Prototyping, RAD Models |  |
| **L5** | Comparison of above models and their applications |  |
|  | **UNIT 2 : Requirements Analysis and Specifications** |  | 1. *Aggarwal, K. K. & Singh, Yogesh (2008). Software Engineering. New Age International Publishers*. |  |  |
| **L6** | Requirements Engineering-Crucial steps; types of requirements |
| **L7** | Requirements documentation – Nature of SRS, characteristics of a good SRS |
| **L8** | Use case approach with guidelines | **Assignment – 1** |
| **L9** | Problems on Use Case diagram |
| **L10** | DFD (Level 0, 1, 2 and 3) |
| **L11** | Organization of the SRS |  |
|  | **UNIT 3: Software Project Planning** |  | 1. *Aggarwal, K. K. & Singh, Yogesh (2008). Software Engineering. New Age International Publishers*. |  |  |
| **L12** | Size Estimation – LOC and Function Count, Albrecht FPA |  |
| **L13** | Cost estimation– Static, Single variable and Multivariable Models (SEL, Watson Felix model) |  |
| **L14** | The Constructive Cost model: basic, intermediate model |  |
| **L15** | Cost-benefit evaluation techniques (Net Profit, Payback period, ROI, NPV computation) |
| **L16** | Problems(numerical) on above methods |  |
|  |  |  |
|  | **UNIT 4 : Software Metrics** |  |
| **L17** | Understanding metrics: definition, process metrics, product and project metrics, areas of applications |  |
| **L18** | Product metrics – Metrics for source code; metrics for testing(Halstead metrics); |  |
| **L19** | Numericals based on above metrices |  |
| **L20** | Metrics for maintenance and numericals |  |
|  | **UNIT 5: Software Testing** |  | 1. *Aggarwal, K. K. & Singh, Yogesh (2008). Software Engineering. New Age International Publishers*. |  |  |
| **L21** | Understanding software testing, its need and objectives; Error, mistake, bug, fault and failure |
| **L22** | Test, test case and test suite; Verification & Validation; Alpha, Beta and Acceptance Testing |  |
| **L23** | Functional (BBT) Testing –characteristics, pros & cons |  |
| **L24** | Boundary Value Analysis with numerical problems |  |
| **L25** | Equivalence Class testing with numerical problems |
| **L26** | Structural Testing (WBT) – concept; characteristics, its pros and cons; Comparison with BBT |
| **L27** | Path Testing(Flow graph) with problems |
| **L28** | Cyclomatic complexity with numericals |
|  | **UNIT 6 : Project Quality and Risk Management** |  |  |  |  |
| **L29** | Understanding Software Quality attributes, McCall Model. |  |
| **L30** | ISO 9126 and CMM Model |  |
| **L31** | Software Risk Management : Types of Risks involved |  |
| **L32** | Phases of Risk Management |  |
|  | **UNIT 7: Project Integration and Scope Management** |  | *2.Bob Hughes and Mike Cotterell (2001). Software Project Management. Tata McGraw Hill, New Delhi.* |  |  |
| **L33** | Project Selection and its methods; Understanding Project Scope |  |  |
| **L34** | Role and responsibilities of Project manager and project stakeholders |  |  |
| **L35** | Issues in project staff acquisition ; Team formation and development |  |
| **L36** | Project Life Cycle phases and its deliverables |  |

\*The instructor can either opt for a project or assignments. However, project is preferable.

1. **SUGGESTED READING**

**J.1 Text Books**

1. Software Engineering, New Age International Third Edition, Aggarwal, K. K. & Singh, Yogesh
2. Software Project Management, Tata Mcgraw Hill, New Delhi, Fifth Edition, Bob Hughes And Mike Cotterell

**J.2 Reference Books**

1. Fundamentals of Software Engineering by Rajib Mall
2. Software Engineering by Ian Sommerville, Pearson Education, New Delhi
3. Software Engineering Principles and Practices, OXFORD, New Delhi by Deepak Jain
4. Software Project Management – A Concise Study by S.A. Kelkar.

Note: Also refer to the Web-links/Resources in Blackboard

1. **GUIDELINES**

**Cell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) must be turned off during the lab session.

**e-Mail and online learning tool:** Each student in the class should have UPES e-mail id and a password to access the Blackboard regularly. The best way to arrange meetings with faculty is by email and prior appointment. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.

**Attendance:** Students are required to have **minimum attendance of 75%** in the subject.

1. **COURSE OUTCOME ASSESSMENT**

To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through Continuous assessments. Each assessment is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.

**Sample format for Indirect Assessment of Course outcomes**

|  |
| --- |
| NAME: |
| ENROLLMENT NO: |
| SAP ID: |
| COURSE: |
| PROGRAM: |

Please rate the following aspects of course outcomes of Software Engineering & Project Management.

Use the scale 1-4\*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sl. No. | Outcome | 1 | 2 | 3 | 4 |
| 1 | Understand various software process models such as waterfall, Spiral and evolutionary models. |  |  |  |  |
| 2 | Demonstrate effective teamwork and strong working knowledge of ethics and professional responsibility for managing the software projects. |  |  |  |  |
| 3 | Demonstrate effective project execution, quality control and risk management techniques that result in successful projects. |  |  |  |  |
| 4 | Conduct project planning activities that accurately forecast project costs, timelines and quality. |  |  |  |  |
| 5 | Conduct standard tests and measurements for validation of projects; to conduct, analyze, and interpret results; and to apply results to improve processes. |  |  |  |  |

3

Below Average

Good

1

**\***

Very Good

Average

4

2