**COURSE PLAN**

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| --- | --- |
| **Target** | 35% (marks) |
| **Level-1** | 35% (population) |
| **Level-2** | 45% (population) |
| **Level-3** | 55% (population) |

1. **Method of Evaluation**

|  |  |
| --- | --- |
| **UG** | **PG** |
| Quizzes/Tests/Assignments (30%) | Quizzes/Tests, Assignments, seminar (50%) |
| Mid Examination (20%) | End semester (50%) |
| End examination (50%) |  |

1. **Passing Criteria**

|  |  |  |
| --- | --- | --- |
| **Scale** | **PG** | **UG** |
| **Out of 10 point scale** | SGPA – “6.00” in each semester  CGPA – “6.00”  Min. Individual Course Grade  –  “C”  Course Grade  Point –  “4.0” | SGPA – “5.0” in each semester  CGPA – “5.0”  Min. Individual Course Grade  –  “C”  Course Grade  Point –  “4.0” |

\*for PG, passing marks are 40/100 on a paper

\*for UG, passing marks are 35/100 on a paper

1. **Pre-requisites:** Basic Knowledge Linux operating system.
2. **Pedagogy:** Presentations, Classroom sessions, Activities, Lectures
3. **Topics introduced for the first time in the program through this course: NA**
4. **References:**

|  |  |  |
| --- | --- | --- |
| **Textbooks** | **Web resources** | **Reference books** |
| 1. DevOps (IBM ICE Publications) | https://upessocs.github.io/#dir=/Lectures/DevOps%20CCVT/&file=list.txt |  |

**Signature of HOD/Dean Signature of Faculty:**

**Date: Date:** 1/Aug/2024

**GUIDELINES TO STUDY THE SUBJECT**

**Instructions to Students:**

1. Go through the 'Syllabus' in the LMS section of the website (<https://lms.upes.ac.in>) to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your online lecture notes (Content, videos) in the appropriate sections as highlighted by the instructor. Make sure you use them during this course.
4. Check your LMS regularly.
5. Go through the study materials.
6. Check mail and announcements on the LMS.
7. Keep updated with the posts, assignments, and examinations which shall be conducted on the LMS.
8. Be regular, so that you do not suffer in any way.
9. **Cell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the classroom.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a password to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on an online learning tool. Various research papers/reference material will be mailed/uploaded on the online learning platform from time to time.
11. **Attendance:** Students are required to have a minimum attendance of 75% in each subject. Students with less than the said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester!

If you need us for anything, send your feedback **through e-mail** to your concerned faculty. Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

**RELATED OUTCOMES**

1. **The expected outcomes of the Program are:**

|  |  |
| --- | --- |
| PO1 | Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | 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. |
| PO3 | 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 public health and safety, and cultural, societal, and environmental considerations. |
| PO4 | Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis, interpretation of data, and synthesis of the information to provide valid conclusions. |
| 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 professional engineering practice. |
| PO7 | 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. |
| PO8 | Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| PO9 | Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| 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. |
| 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. |

1. **The expected outcomes of the Specific Program are:**

|  |  |
| --- | --- |
| PSO1 | Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem-solving and optimizing techniques. |
| PSO2 | Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms. |
| PSO3 | To design CI/CD automation pipelines |

1. **The expected outcomes of the Course are:**

At the end of the course, the learner will be able to:

|  |  |
| --- | --- |
| CO1 | Explain the DevOps fundamentals and business applications |
| CO2 | Apply the DevOps tools for real world problem solving |
| CO3 | Apply the high-throughput and data intensive applications programming. |
| CO4 | Apply testing, deployment, monitoring, issue tracking and workflow for DevOps based solutions |

1. **CO-PO/PSO Relationship Matrix**

1-Weakly mapped (low) 2-Moderately mapped (Medium) 3-Strongly mapped (high) 0-No correlation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PO CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 |
| CO2 | 1 | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 |
| CO3 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 |
| CO4 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 |
| Average | 1 | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 1 |

1. **Course Outcomes Assessment Plan**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Components  Course Outcomes | Quiz-1 | Quiz-2 | Assignment-1 | Assignment-2 | Quiz-3 | Mid Semester | End Semester |
| CO1 |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Internal Assessment Component** | **Weightage in calculation of Internal Assessment (100 marks)** |
| Quiz-1 (Unit-1,2) | 20% |
| Quiz-2 (Unit-4,5) | 20% |
| Quiz-3 (Unit-6,7) | 20% |
| A1 (Unit-3,4) | 20% |
| A2 (Unit-4) | 20% |
| A3 (Unit-5,6) | 20% |

**OVERVIEW OF COURSE DELIVERY / BROAD PLAN OF COURSE COVERAGE**

**Course Activities:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.No.** | **Description** | **Planned** | | | **Actual** | | | **Remarks** |
| **From** | **To** | **No. of Sessions** | **From** | **To** | **No. of Sessions** |
| 1 | **Introduction to DevOps** | 1 Jan | 17 Jan | 5 | 1 Jan | 20 Jan | 5 | CO1 |
| 2 | **Business needs for DevOps** | 18 Jan | 30 Jan | 4 | 21 Jan | 5 Feb | 6 | CO1 |
| 3 | **DevOps Adoption** | 1 Feb | 8 Feb | 4 | 6 Feb | 18 Feb | 6 | CO1, CO2 |
| 4 | **DevOps Principles and LifeCycle** | 9 Feb | 20 Feb | 6 | 19 Feb | 25 Feb | 6 | CO2 |
| 5 | Common Tools for DevOps | 21 Feb | 10 Mar | 6 | 26 Feb | 16 Mar | 5 | CO3 |
| 6 | Testing, Automated Deployment and Monitoring | 11 Mar | 31 Mar | 6 | 17 Mar |  | 7 | CO4 |
| 7 | **Issue Tracking and Workflow** | 1 Apr | 15 Apr | 5 |  |  | 5 | CO4 |

Total No. of Instructional periods available for the course = 45

**Signature of HOD/Dean Signature of Faculty:**

**Date: Date:** 15/Jan/2025

**SESSION PLAN**

**UNIT-I**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 1 | What is DevOps? How DevOps works, Benefits of DevOps | CO1 |
| 2 | DevOps practices, history, Agile vs DevOps, Kanban & Scrum | CO1 |
| 3 | DevOps tools: Continuous Development, Integration, Testing | CO2 |
| 4 | DevOps tools: Continuous Deployment, Monitoring | CO2 |
| 5 | DevSecOps, DevOps vs SRE, DevOps toolchain | CO1, CO2 |

**UNIT-II**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 6 | Business needs for DevOps, Why DevOps is needed? | CO1 |
| 7 | DevOps teams, cross-functionality, CI vs CD vs CDelivery | CO1, CO2 |
| 8 | DevOps tools for Agile, Differences between Agile & DevOps | CO1, CO2 |
| 9 | Case Study: Problem with Silos development | CO1, CO2 |

**UNIT-III**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 10 | DevOps adoption, Lean & Kaizen principles | CO1 |
| 11 | Challenges of DevOps adoption, Monolithic vs Microservices | CO1, CO2 |
| 12 | DevOps architecture, Cloud & DevOps resiliency | CO2, CO4 |
| 13 | Resilience process (Detect, Alert, Respond, Refine) | CO4 |

**UNIT-IV**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 14 | DevOps principles, Version Control (SVN, Git, GitHub) | CO2, CO3 |
| 15 | Gitflow workflow, CI with GitHub Actions | CO2, CO3 |
| 16 | Infrastructure as Code, Continuous Delivery & Deployment | CO2, CO4 |
| 17 | Continuous Monitoring, DevOps pipeline using Jenkins | CO4 |
| 18 | Metrics tools, DevOps lifecycle | CO2, CO4 |
| 19 | Digital transformation & role of DevOps | CO1, CO4 |

**UNIT-V**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 20 | Selecting the right DevOps tools, Docker & Kubernetes | CO2, CO3 |
| 21 | Puppet, Ansible, DevOps monitoring tools | CO2, CO4 |
| 22 | Version control & code repository tools | CO2, CO3 |
| 23 | IBM Case Study: CI/CD techniques | CO2, CO4 |
| 24 | Hands-on: Setting up CI/CD pipelines | CO2, CO4 |
| 25 | Hands-on: Infrastructure automation | CO2, CO4 |

**UNIT-VI**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 26 | Introduction to testing, Verification & Validation | CO4 |
| 27 | Types of testing (White-box, Manual, Automation) | CO4 |
| 28 | Software build process, Test case writing | CO4 |
| 29 | Automation testing tools & best practices | CO4 |
| 30 | Manual vs Automated Deployment | CO4 |
| 31 | DevOps monitoring & alerting tools, IBM Case Study | CO4 |

**UNIT-VII**

|  |  |  |
| --- | --- | --- |
| Lecture No. | Topics to be Covered | CO Mapped |
| 32 | Issue tracking tools & functionalities | CO4 |
| 33 | Bugzilla, GitLab Tracker, Jira | CO4 |
| 34 | Types of bugs, classification of software errors | CO4 |
| 35 | Open-source issue trackers, Workflow configuration | CO4 |
| 36 | DevOps with emerging tech (Big Data, IoT) | CO1, CO4 |

**INDIRECT ASSESSMENT**

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

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

Please rate the following aspects of course outcomes of the DevOps Course.

Use the scale 1-3\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Outcomes** | **Statement** | **1** | **2** | **3** |
| CO1 | Explain the DevOps fundamentals and business applications |  |  |  |
| CO2 | Apply the DevOps tools for real world problem solving |  |  |  |
| CO3 | Apply the high-throughput and data intensive applications programming. |  |  |  |
| CO4 | Apply testing, deployment, monitoring, issue tracking and workflow for DevOps based solutions |  |  |  |

\* 1 – Weak, 2 – Moderate, 3 – Strong