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**UNIVERSITY OF PETROLEUM & ENERGY STUDIES**

**College of Engineering Studies**

**Dehradun**

**COURSE PLAN**

Programme : B. Tech CSE CCVT

Course : Storage Technology Foundation

Subject Code : CSEG 2012

No. of credits : 3

Semester : IV

Session : January 2019 to May 2019

Batch : 2017-2021

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**Approved By**

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**COURSE PLAN**

1. **PREREQUISITE:**

* Basic knowledge of Computer System Architecture.
* Basic knowledge of IT Infrastructure Landscape Overview.

1. **PROGRAM OUTCOMES (POs) and PROGRAM SPECIFIC OUTCOMES (PSOs) for BTech CS CCVT**

**B1. PROGRAM OUTCOMES (POs)**

Engineering Graduates will be able to:

**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 the public health and safety, and the cultural, societal, and 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.

**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 team work**: 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.

**B2 . PROGRAM SPECIFIC OUTCOMES**

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: Ability to understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business oriented environment with optimized performance tuning and data reliability

1. **COURSE OUTCOMES (COs) for B.Tech in Computer Science and Engineering with Specialization in CCVT**

CO1. Complexity of Information Management & Importance of Information Availability World Wide Information Growth & Key Issues & Solutions.

CO2. Storage Environment & Understanding the Intricacies.Logical Components & File Systems & Volume Management

CO3. Network Storages & Control Station

CO4. Comparison of Architectures & Architecture Recommendations

CO5. Business Continuity Management and infrastructure & Key Elements & Monitoring Processes

**Table: Correlation of POs and PSOs v/s COs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PO/CO | PO  1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO  9 | PO  10 | PO  11 | PO  12 | PSO  1 | PSO  2 | PSO  3 |
| CO1 | 3 | 3 | 1 |  | 2 | 3 |  |  |  |  |  | 2 | 1 | 3 | 2 |
| CO2 | 3 | 3 | 1 |  | 2 | 2 |  |  |  |  |  | 2 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 2 |  |  |  |  |  | 2 | 2 | 3 | 2 |
| CO4 | 2 | 2 | 2 |  | 2 | 2 | 1 |  |  |  |  | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 1 | 2 | 2 | 2 | 2 |  |  |  |  | 3 | 1 | 2 | 2 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning | Perform system and application programming using computer system concepts | Apply software development and project management methodologies | Ability to understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business-oriented environment with optimized performance tuning and data reliability. |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO 4 | PO 5 | PO6 | PO 7 | PO8 | PO9 | PO 10 | PO 11 | PO12 | PSO 1 | PSO 2 | PSO 3 |
| CSIB 255 | Storage Technology Foundation | 3 | 3 | 1 | 1 | 2 | 2 | 1 |  |  |  |  | 2 | 2 | 3 | 2 |

1. **PEDAGOGY**

* Assignments
* Quiz,Tests
* Presentations

1. **COURSE COMPLETION PLAN**

|  |  |
| --- | --- |
| Total Sessions | 36 |
| Total Quiz | 02 |
| Total Assignments | 02 |
| TEST | 02 |

One Session =60 minutes

1. **EVALUATION & GRADING**

Students will be evaluated based on the following 3 stages.

Internal Assessment - 30%

Mid-Term Examination - 20% (OFFLINE)

End-Term Examination - 50%

**F1. INTERNAL ASSESSMENT: WEIGHTAGE – 30%**

Internal Assessment shall be done based on the following:

|  |  |  |
| --- | --- | --- |
| Sl. No. | Description | % of Weightage out of 30% |
| 1 | Class Tests and Quizzes | 40% |
| 2 | Assignments (Problems/Presentations) | 40% |
| 3 | Attendance and conduct in the class and concept diary | 20% |

Each Assessment is carried out for suitable marks and finally reduced suitably based on its weightage. At course completion, the student is awarded with the grade based on the composite score obtained out of 100 marks (30% IA + 20% MS + 50% ES).

**F2*. Internal Assessment Record Sheet (including Mid Term Examination marks)*** *will be displayed at the end of semester i.e. last week of regular classroom teaching.*

**F3. MID TERM EXAMINATION: WEIGHTAGE – 20%**

Mid Term examination is an offline examination with 2 hour duration.

***Date of showing the score of Mid Term Examination: After completion of mid Sem examination.***

**F4. END TERM EXAMINATION: WEIGHTAGE – 50%**

End Term Examination shall be Three Hours duration and shall be a combination of Short and Long theory/numerical Questions.

**F5. GRADING:**

The overall marks obtained at the end of the semester comprising all the above three mentioned shall be converted to a grade.

1. **COURSE DELIVERY PLAN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SESSION** | **TOPIC** | **Course Outcomes Addressed** | **Required Learning Resources**  **(including media)** | **Pedagogy/**  **Discussion(s)/ Postings** | **Assessment** |
| **Unit 1: Complexity of Information Management** | | | | | |
| 1 | Importance of Information Availability | C01 | **Books:**  Information Storage & Management, EMC Education Services  **Reference:** 1. <https://education.emc.com/guest/certification/framework/stf/stf.aspx>  / | Classroom and Presentation |  |
| 2 | Challenges of Information Management | C01 |  |
| 3 | Data Storage Need | C01 |  |
| 4 | Creation of Data | C01 |  |
| 5 | Value of Data to business | C01 |  |
| 6 | Types of Data | C01 |  |
| 7 | Storing Data | C01 |  |
| 8 | World Wide Information Growth | C01 |  |
| 9 | Key Issues & Solutions | C01 | Assignment 1 |
| **UNIT-II Storage System Architecture** | | | | | |
| 10 | Storage Environment | C02 | **Books:**  Information Storage & Management, EMC Education Services | Classroom and Presentation |  |
| 11 | Understanding the Intricacies | C02 |  |
| 12 | Storage & the Media | C02 |  |
| 13 | Logical Components | C02 |  |
| 14 | File Systems | C02 |  |
| 15 | **V**olume Management | C02 |  |
| 16 | Host Bus Adapter (HBA) | C02 |  |
| 17 | **-**Improving Data Availability | C02 |  |
| 18 | Connectivity & Communication Protocols | C02 |  |
| 19 | RAID Arrays | C02 | Test1/quiz1 |
| **UNIT-III: Network Storage – I** | | | | | |
| 20 | Storage Solutions | C03 | **Books:**  Information  Storage  &  Management, EMC Education  Services | Classroom presentation |  |
| 21 | DAS | C03 |  |
| 22 | NAS | C03 |  |
| 23 | FC – SAN | C03 |  |
| 24 | IP – SAN | C03 |  |
| 25 | CAS | C03 |  |
| 26 | Control Station | C03 |  |
| 27 | Gateway | C03 | Assignment 2 |
| **UNIT-IV: Network Storage – II** | | | | | |
| 28 | **L1,29-**Comparison of Architectures | CO4 | **Books:**  Information  Storage  &  Management, EMC Education  Services | Classroom presentation |  |
| 29 | **L2,30-** Architecture Recommendations | CO4 |  |
| **UNIT-V: Business Continuity Management and infrastructure** | | | | | |
| 30 | Architecture of Data Centre  Infrastructure | C05 | **Books:**  Information  Storage  &  Management, EMC Education  Services |  |  |
| 31 | Infrastructure Management | C05 |  |  |
| 32 | Backup & recovery | C05 |  |  |
| 33 | Key Elements & Monitoring Processes | C05 |  |  |
| 34 | Information Lifecycle Management | C05 |  |  |
| 35 | Discussion on upcoming technologies with the current scenario | C05 |  | Test 2/quiz2 |
| 36 | C05 |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

1. **SUGGESTED READINGS:**

**Text Books**

T1. G.Somasundram ,Information Storage & Management, EMC Education Services

**Reference Books**

**R1:** Ulf Troppens,Storage Networks Explained.

**GUIDELINES**

***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 class room.

***E-Mail and online learning tool:*** Each student in the class should have an e-mail id and a pass word 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 online learning tool. 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 each subject. Students with less than said percentage shall **NOT** be allowed to appear in the end semester examination.

**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 quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination 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.

***Passing criterion:*** Student has to secure minimum 30%/40% marks of the “highest marks in the class scored by a student in that subject (in that class/group class)” individually in both the ‘End-Semester examination’ and ‘Total Marks’ in order to pass in that paper.

* Passing Criterion for B. Tech: minimum 35 marks in the subject