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**Birla Institute of Technology & Science, Pilani**

**Work Integrated Learning Programmes**

**Course handout**

**Part A: Content Design**

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| --- | --- |
| **Course Title** | Open Source Software Engineering |
| **Course No(s)** | SEZG587 |
| **Credit Units** | 4 |
| **Course Author** | Ritu Arora |
| **Version No** | 3.0 |
| **Date** | July 2021 |

**Course Objectives:**

|  |  |
| --- | --- |
| **No** | **Course Objective** |
| **CO1** | To enable students to learn basic and advanced concepts in Open Source Software Engineering, as employed by the open-source community |
| **CO2** | To familiarize students with the open source movement, its philosophy and the history behind it |
| **CO3** | To provide a deeper understanding of various licensing issues associated with open source software and its societal, commercial, legal and philosophical origins and impacts |
| **CO4** | To enable students to understand open source process, its development methods, associated tools and communication mechanisms |

**Learning Outcomes:**

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| --- | --- |
| **No** | **Learning Outcome** |
| **LO1** | Students will be able to understand and explain the nature of open source software, and the ways in which it differs from proprietary software |
| **LO2** | Students will be able to describe the concept of software licensing for open source software, distinguish between different types of licences, and be able to choose an appropriate license type keeping in mind the associated rules and regulations |
| **LO3** | Students will be able to understand ~~agile development processes~~ and use them to develop open source software by effectively collaborating with fellow student or community members |
| **LO4** | Students will be able to contribute to the development of open source software |

**The following advisory pre-requisites are not mandatory, however, student would benefit more if he/she has good knowledge of the following courses:**

* **Software Engineering or its equivalent**
* **Object Oriented Programming (with Java) or its equivalent**

**Reference Books and Material:**

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| --- | --- |
| **R1** | Producing Open Source Software: How to Run a Successful Free Software Project, 2nd edition, Karl Fogel |
| **R2** | Practical Open Source Software Exploration, Greg DeKoenigsberg, Chris Tyler, Karsten Wade, Max Spevack, Mel Chua, and Jeff Sheltren |
| **R3** | Getting Started With Open Source Software Development by Rachna Kapur, Mario Briggs, Tapas Saha, Ulisses Costa, Pedro Carvalho, Raul F. Chong, Peter Kohlmann; DB2 ON CAMPUS Book Series |
| **Web References** | |
| **W1** | Open Source Initiative (https://opensource.org/) |
| **W2** | Open Source Resources (https://opensource.com/) |
| **W3** | Open Source Guides (https://opensource.guide/) |
| **W4** | Working with GitHub for Open Source Software Development (https://github.com/) |

**Content Structure**

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| --- | --- |
| **Module No** | **List of Topic Title** |
| M1 | **Introduction to Open Source Software**   * What is Open Source Software? * Principles of Open Source Software * Advantages and Disadvantages of OSS * Cost of Open Source Software * History of Open Source Software |
| M2 | **Understanding Free and Open Source**   * Understanding Free Software * Understanding Open Source Software * Understanding Freeware * Understanding Public- domain Software |
| M3 | **Understanding Open Source Licensing Models**   * Understanding Intellectual Property Rights and Software Licenses * Licensing models in OSS: Copyright, Copyleft, Permissive, Creative Commons * Choosing an Open Source License |
| M4 | **Understanding Open Source Business Model**   * Dual Licensing and Open Core Model * Selling users, services and merchandise * Donations, funding and Crowd-Sourcing * Other business models |
| M5 | **Lifecycle and methodologies in Open Source Software**   * Open Collaboration Model * Community Driven Development * Open Source Software Development Process Model * Comparing OSS development methodologies with traditional methodologies |
| M6 | **Contributing to Open Source Software Projects**   * Contribution models * How to use/adapt the open source software ecosystem * Starting your own Open Source Project * Key characteristics of OSS projects * Key challenges in OSS projects * Best practices in running/ managing OSS project |
| M7 | **Tools and Technologies in OSSE**   * Collaboration Tools * Communication Tools * Source Code Management Tools * Run-time System Constraints |
| M8 | **Working with Git/GitHub/GitHub Desktop**   * GitHub Workflows * Working with Repositories * Push-Pull model * Unique Characteristics of Git * Git Branching * Working with GitHub pages * Mastering Markdown |
| M9 | **Understanding Open Source Projects (Case Study):**   * Linux Project * Kubernetes Project * Eclipse Project * Moodle Project |

**Part B: Contact Session Plan**

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| **Academic Term** |  |
| **Course Title** | Open Source Software Engineering |
| **Course No** |  |
| **Lead Instructor** | Dr. Ritu Arora |

## Glossary of Terms

1. Contact Hour (CH) stands for a hour long live session with students conducted either in a physical classroom or enabled through technology. In this model of instruction, instructor led sessions will be for 22 CH.
   1. Pre CH = Self Learning done prior to a given contact hour
   2. During CH = Content to be discussed during the contact hour by the course instructor
   3. Post CH = Self Learning done post the contact hour
2. Contact Hour (CS) stands for a two-hour long live session with students conducted either in a physical classroom or enabled through technology. In this model of instruction, instructor led sessions will be for 11 CS.
   1. Pre CS = Self Learning done prior to a given contact session
   2. During CS = Content to be discussed during the contact session by the course instructor
   3. Post CS = Self Learning done post the contact session
3. RL stands for Recorded Lecture or Recorded Lesson. It is presented to the student through an online portal. A given RL unfolds as a sequences of video segments interleaved with exercises
4. SS stands for Self-Study to be done as a study of relevant sections from textbooks and reference books. It could also include study of external resources.
5. LE stands for Lab Exercises
6. HW stands for Home Work.
7. M stands for module. Module is a standalone quantum of designed content. A typical course is delivered using a string of modules. M2 means module 2.

## Teaching Methodology (Flipped Learning Model)

The pedagogy for this course is centered around flipped learning model in which the traditional class-room instruction is replaced with recorded lectures to be watched at home as per the student’s convenience and the erstwhile home-working or tutorials become the focus of classroom contact sessions. Students are expected to finish the home works on time.

## Contact Session Plan

* Each Module (M#) covers an independent topic and module may encompass more than one Recorded Lecture (RL).
* Contact Sessions **(2hrs each week)** are scheduled alternate weeks after the student watches all Recorded Lectures (RLs) of the specified Modules (listed below) during the previous week
* In the flipped learning model, Contact Sessions are meant for in-classroom discussions on cases, tutorials/exercises or responding to student’s questions/clarification--- may encompass more than one Module/RLs/CS topic.
* Contact Session topics listed in course structure (numbered CSx.y) may cover several RLs; and as per the pace of instructor/students’ learning, the instructor may take up more than one CS topic during each of the below sessions.

## Detailed Structure

**Introductory Video/Document:** *<< Introducing the faculty, overview of the course, structure and organization of topics, guidance for navigating the content, and expectations from students>>*

* Each of the sub-modules of **Recorded Lectures** (RLx.y ) shall delivered via **30 – 60mins videos** followed by:
* **Contact session** (CSx.y) of 2Hr each for illustrating the concepts discussed in the videos with exercises, tutorials and discussion on case-problems (wherever appropriate); contact sessions (CS) may cover more than one recorded-lecture (RL) videos.

## Course Contents

**Contact Session 1**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL1.1 | What is Open Source Software? | Lecture Notes & Slides |
| RL1.2 | Principles of Open Source Software | Lecture Notes & Slides |
| RL1.3 | Advantages and Disadvantages of OSS | Lecture Notes & Slides |
| RL1.4 | Cost of Open Source Software | Lecture Notes & Slides |
| RL1.5 | History of Open Source Software | Lecture Notes & Slides |
| During CS | CS | **Introduction to Open Source Software**   * What is Open Source Software? * Principles of Open Source Software * Advantages and Disadvantages of OSS * Cost of Open Source Software * History of Open Source Software | R1, R2, R3  Web Resources: W1 |
| Post CS | SS1 | **Recommended Reading:**   * https://opensource.org | |
| HW1 | * Apart from open source software, what other areas operate through the open-collaboration model. Identify, list and elaborate. * Identify categories of Open Source Software currently available and give at-least two examples of each. | |
| Lab Reference |  |  |  |

**Contact Session 2**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL2.1 | Understanding Free Software | Lecture Notes & Slides |
| RL2.2 | Understanding Open Source Software | Lecture Notes & Slides |
| RL2.3 | Understanding Freeware | Lecture Notes & Slides |
| RL2.4 | Understanding Public- domain Software | Lecture Notes & Slides |
| During CS | CS | **Understanding Free and Open Source**   * Understanding differences between Free Software, OSS, Freeware and Public-domain software | R1, R2, R3  Web Resources |
| Post CS | SS1 | **5 Reasons Why Contributing To Open Source Projects Helps In Landing A Job**  [https://analyticsindiamag.com/5-reasons-why-contributing-to-open-source-projects-helps-in-landing-a-job/ ]  **Recommended Reading:**   * https://opensource.org/osd * https://opensource.org/licenses/category | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Contact Session 3**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL3.1 | Understanding Intellectual Property Rights and Software Licenses | Lecture Notes & Slides |
| RL3.2 | Licensing models in OSS: Copyleft, Permissive, Creative Commons | Lecture Notes & Slides |
| During CS | CS | **Understanding Open Source Licensing Models**   * Understanding Intellectual Property Rights and Software Licenses * Licensing models in OSS: Copyright, Copyleft, Permissive, Creative Commons | R1, R2, R3  Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * Google Image Search Implements CC License Filtering:   [https://creativecommons.org/2009/07/09/google-image-search-implements-cc-license-filtering/](about:blank)   * [https://www.gnu.org/licenses/copyleft.en.html](about:blank) * [https://copyleft.org/](about:blank) * [https://creativecommons.org](about:blank) | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Contact Session 4**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL3.2 | Licensing models in OSS: Copyleft, Permissive, Creative Commons | Lecture Notes & Slides |
| RL3.3 | Choosing the right license | Lecture Notes & Slides |
| During CS | CS | **Understanding and Choosing Open Source Licensing Models**   * Work with a community * Keep it simple and permissive * Need to share improvements * Work without a license | R1, R2, R3  Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * [https://choosealicense.com/](about:blank) * **Apache License 2.0 (**[https://www.apache.org/licenses/LICENSE-2.0](about:blank)) | |
| HW1 | * Identify 3 Open Source Software projects and study the type of license used. * Select one license and study it in detail. * Search for some open source project that requires a CLA. * Study the CLA and discuss its salient points. | |
| Lab Reference |  |  |  |

**Contact Session 5**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL4.1 | Dual Licensing and Open Core Model | Lecture Notes & Slides |
| RL4.2 | Selling users, services and merchandise | Lecture Notes & Slides |
| RL4.3 | Donations, funding and Crowd-Sourcing | Lecture Notes & Slides |
| RL4.4 | Other business models | Lecture Notes & Slides |
| During CS | CS | **Understanding Open Source Business Model**   * Dual Licensing and Open Core Model * Selling users, services and merchandise * Donations, funding and Crowd-Sourcing * Other business models | R1, R2, R3  Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * How Developers Can Make money with Open Source Projects   [https://rubygarage.org/blog/how-make-money-with-open-source-projects](about:blank)   * What Motivates a Developer to Contribute to Open-Source Software?   [https://clearcode.cc/blog/why-developers-contribute-open-source-software/](about:blank)   * How do Open Source Programmers make money   [https://www.thewindowsclub.com/open-source-companies-programmers-make-money](about:blank) | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Contact Session 6**

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL5.1 | Open Collaboration Model | Lecture Notes & Slides |
| RL5.2 | Community Driven Development | Lecture Notes & Slides |
| RL5.3 | Open Source Software Development Process | Lecture Notes & Slides |
| RL5.4 | Comparing OSS development methodologies with traditional methodologies | Lecture Notes & Slides |
| During CS | CS | **Lifecycle and methodologies in OSS**   * Open Collaboration Model * Community Driven Development * OSS Development Process Model * Comparison between OSS development methodologies with traditional | R1, R2, R3  Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * Open Source Software Development Model   [http://aaaea.org/Al-muhandes/2008/February/open\_src\_dev\_model.htm](about:blank)   * Innovation Happens Elsewhere   [https://dreamsongs.com/IHE/IHE-28.html](about:blank) | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Contact Session 7**

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| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL6.1 | Contribution models and roles in OSS | Lecture Notes & Slides |
| RL6.2 | Starting your own Open Source Project | Lecture Notes & Slides |
| RL6.3 | How to use/adapt the open source software ecosystem | Lecture Notes & Slides |
| RL6.4 | Best practices in OSS project | Lecture Notes & Slides |
| During CS | CS | **Contributing to Open Source Software Projects**   * Contribution models * How to use/adapt the open source software ecosystem * Starting your own Open Source Project * Key characteristics of OSS projects * Key challenges in OSS projects * Best practices in OSS project | Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * How to contribute to Open Source   [https://opensource.guide/how-to-contribute/](about:blank) | |
| HW1 | Try this out   * [https://github.com/firstcontributions/first-contributions/blob/master/README.md](about:blank) | |
| Lab Reference |  |  |  |

**Contact Session 8**

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| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL7.1 to  RL 7.3 | Tools and Technologies in OSSE | Lecture Notes & Slides |
| During CS | CS | **Tools and Technologies in OSSE**   * Collaboration Tools * Communication Tools * Source Code Management Tools * Run-time System Constraints | Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * Types of version control systems   [https://subscription.packtpub.com/book/application\_development/9781849517522/1/ch01lvl1sec12/types-of-version-control-systems](about:blank)   * Git Book   [https://git-scm.com/book/en/v2/Getting-Started-About-Version-Control](about:blank) | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Contact Session 9 and 10**

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| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL8.1 | GitHub Workflows; Working with Repositories; Push-Pull model | Lecture Notes & Slides |
| RL8.2 | Working with GitHub pages | Lecture Notes & Slides |
| RL8.3 | Mastering Markdown | Lecture Notes & Slides |
| RL8.4 | Git Branching | Lecture Notes & Slides |
| During CS | CS | **Working with Git/GitHub/GitHub Desktop**   * GitHub Workflows * Working with Repositories * Push-Pull model * Unique Characteristics of Git * Working with GitHub pages * Mastering Markdown * Git Branching | Web Resources |
| Post CS | SS1 | **Recommended Reading:**   * GitHub Pages   [https://pages.github.com/](about:blank) | |
| HW1 | **Create Your Own GitHub Page**   * Navigate to GitHub.com * Create an account – it is linked to your email id * Example –username is ritubits * Create a repository in your login with the same name as your username – ritubits.github.io * You may NOT choose any license for the same * Create a file index.html * Use HTML to write content - create your profile page * View your profile: [https://ritubits.github.io/](about:blank) | |
| Lab Reference |  |  |  |

**Contact Session 11**

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| --- | --- | --- | --- |
| Time | Type | Description | Content Reference |
| Pre CS | RL9.1 | Case Study | Lecture Notes & Slides |
| During CS | CS | **Understanding Open Source Projects (Case Study):**   * Linux Project * Kubernetes Project * Eclipse Project * Moodle Project | Web Resources |
| Post CS | SS1 |  | |
| HW1 |  | |
| Lab Reference |  |  |  |

**Detailed Plan for Experiential Learning Components**

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| --- | --- | --- | --- |
| **Lab No** | **Lab Objective** | **Lab Sheet Access URL** | **Content Reference** |
| 1. | Working with GitHub  The aim of this lab sheet is to develop an understanding about the basic environment and workflow of GitHub. It also guides the students to create a repo on GitHub and initialize it with some relevant files. Additionally, it helps students to familiarize themselves with the various open source projects available on GitHub and navigate through them.  Technologies used: GitHub.com |  |  |
| 2. | Using GitHub and GitHub Desktop for contributing to Open Source Projects  The aim of this lab sheet is to guide the student to develop an understanding of the simple process in which one can contribute to open source projects hosted on GitHub and also provides a hands-on on the same.  Technologies used: GitHub.com, GitHub Desktop |  |  |
| 3. | Using Eclipse to contribute to Open Source Java Projects hosted over GitHub  The aim of this lab sheet is to guide the students to be able to configure and use Eclipse IDE to work with Java project repositories hosted over GitHub.  Technologies used: GitHub.com, Eclipse IDE |  |  |
| 4. | Working with Git  The aim of this lab sheet is to develop an understanding of the basic Git commands used for uploading, cloning, committing and pushing content to GitHub.  Technologies used: GitHub.com, Git |  |  |

**Evaluation Components**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No** | **Name** | **Type** | **Duration** | **Weight** | **Day, Date, Session, Time** |
| EC-1 | Quiz-I | Online / Open Book |  | 5% | Pre-mid sem |
| Quiz-II | Online / Open Book |  | 5% | Post-mid sem |
| Assignment I /  Project – Phase I | Online / Open Book |  | 10% | Pre-mid sem |
| Assignment-II /  Project – Phase II | Online / Open Book |  | 10% | Post-mid sem |
| EC-2 | Mid-Semester Exam | Open Book | 1.5 Hours | 30% |  |
| EC-3 | Comprehensive Exam | Open Book | 2 Hours | 40% |  |

***Note*** *- Evaluation components can be tailored depending on the proposed model.*

## Important Information:

Evaluation Guidelines:

1. For Closed Book tests: No books or reference material of any kind will be permitted. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
2. For Open Book exams: Use of prescribed and reference text books, in original (not photocopies) is permitted. Class notes/slides as reference material in filed or bound form is permitted. However, loose sheets of paper will not be allowed. Use of calculators is permitted in all exams. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
3. If a student is unable to appear for the Regular Test/Exam due to genuine exigencies, the student should follow the procedure to apply for the Make-Up Test/Exam. The genuineness of the reason for absence in the Regular Exam shall be assessed prior to giving permission to appear for the Make-up Exam. Make-Up Test/Exam will be conducted only at selected exam centres on the dates to be announced later.

It shall be the responsibility of the individual student to be regular in maintaining the self-study schedule as given in the course handout, attend the lectures, and take all the prescribed evaluation components such as Assignment/Quiz, Mid-Semester Test and Comprehensive Exam according to the evaluation scheme provided in the handout.