

**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** | Dr Sashank Dara |
| **Version No** | 4.0 |
| **Date** | September 2023 |

**Course Objectives:**

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| **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 how to develop or adopt 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**
* **Software Architecture and Design Reference Books and Material:**

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| **R1** | Open Source Projects - Beyond Code A blueprint for scalable and sustainable open source projects  John Mertic - 2023 |
| **R2** | Producing Open Source Software: How to Run a Successful Free Software Project, 2nd edition,  Karl Fogel |
| **R3** | Software Transparency: Supply Chain Security in an Era of a Software-Driven Society, By Chris Hughes, Tony Turner · 2023 |
| **Web References** | |
| **W1** | Open Source Initiative (https://opensource.org/) |
| **W2** | Open Source Guides (https://opensource.guide/) |
| **W3** | The Architecture of Open Source Applications (https://aosabook.org/en/) |
| **W4** | The Performance of Open Source Applications (https://aosabook.org/en/posa/introduction.html) |
| **W5** | Practical Open Source Software Exploration  (https://quaid.fedorapeople.org/TOS/Practical\_Open\_Source\_Software\_Exploration/html/index.ht ml) |
| **W6** | Open Standards (https://opensource.com/resources/what-are-open-standards) |
| **W7** | Creative Commons (https://creativecommons.org/) |

**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 Open Source Licensing Models**   * Understanding Free, Open Source, Freeware , Public domain Software * Understanding Intellectual Property Rights and Software Licenses * Licensing models in OSS: Copyright, Copyleft, Permissive, Creative Commons ● Choosing an Open Source License |

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| M3 | **Understanding Open Source Business Model**   * Dual Licensing and Open Core Model * Selling users, services and merchandise * Donations, funding and Crowd-Sourcing * Other business models |
| M4 | **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 * Key characteristics of OSS projects * Key challenges in OSS projects |
| M5 | **Contributing to Open Source Software Projects**   * Contribution models * How to use/adapt the open source software ecosystem * Starting your own Open Source Project * Best practices in running/ managing OSS project * Employer Benefits and Business Value * Open Source Governance Models |
| M6 | **Building and Scaling Open Source Ecosystems**   * Open Source Project Metrics * Handling Growth * Dealing with Conflict * Commercialization of Open Source * Open Source and Talent Ecosystem * Advocacy and Outreach * Transitioning Leadership * Sunsetting the Project |
| M7 | **Consuming Open Source Projects**   * Tools and Technologies in OSSE * Framework for Adopting Open Source * Using Open Source in Commercial Products * Giving Credit and Attributing Open Source * Software Supply Chain * Software Bill of Materials (SBOM) * Standards in SBOM * Open Source in Cloud and Containers * Cloud relevant Bill of Materials Standards |
| M8 | **Open Source Applications Case Studies**   * Architecture of Open Source Applications * Performance of Open Source Applications * Illustrative examples such as Linux, Eclipse, Moodle Project |
| M9 | **Risks of Using Open Source Software**   * Licensing Compliance * Support and Enhancements * Security Risks ( Vulnerabilities , Malware) * Open Source Security Scores (OpenSSF) |

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| M9 | **Open Standards**   * What are Standards * How are Standards developed * What are Open Standards * Open Internet Standards IETF, IRTF, IAB * Open Standards Collaboration versus Open Source Collaboration * Software Standards, Security Standards, Benchmark Standards |
| M10 | **Open Access to Knowledge and Creativity**   * Global Movement of Knowledge Access * Wikipedia, KhanAcademy, Met * Open Artwork (Images, Music, Documents) * Creative Commons (CC) Licensing * Variants of CC * Attribution of CC works |

**Part B: Contact Session Plan**

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| **Academic Term** |  |
| **Course Title** | Open Source Software Engineering |
| **Course No** |  |
| **Lead Instructor** | Harvinder S Jabbal |

**Course Contents**

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| **Contact**  **Session**  **(2Hrs)** | **List of Topic Title**  **(from content structure in Part A)** | **Text/Ref**  **Book/external resource** |
| CS1  M1  IOSS | **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, W1 |
| CS2  M2  OSLM | **Understanding Open Source Licensing Models**   * Understanding Free, Open Source, Freeware, Public domain Software * Understanding Intellectual Property Rights and Software Licenses * Licensing models in OSS: Copyright, Copyleft,   Permissive, Creative Commons   * Choosing an Open Source License | R1, R2 |
| CS3  M3  OSBM | **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 |
| CS4  M4  LMOSS | **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 * Key characteristics of OSS projects * Key challenges in OSS projects | W1, W2 |
| CS5 |
| CS6 | **Contributing to Open Source Software Projects**   * Contribution models * How to use/adapt the open source software ecosystem * Starting your own Open Source Project * Best practices in running/ managing OSS project * Employer Benefits and Business Value * Open Source Governance Models | R1,  W1, W2 |
| CS7  M5  COSSP |

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| CS8  M6  BSOSE | **Building and Scaling Open Source Ecosystems**   * Open Source Project Metrics * Handling Growth * Dealing with Conflict * Commercialization of Open Source * Open Source and Talent Ecosystem * Advocacy and Outreach * Transitioning Leadership * Sunsetting the Project | R1,  W2 |
| CS9 | **Consuming Open Source Projects**   * Tools and Technologies in OSSE * Framework for Adopting Open Source * Using Open Source in Commercial Products * Giving Credit and Attributing Open Source * Software Supply Chain * Software Bill of Materials (SBOM) * Standards in SBOM * Open Source in Cloud and Containers * Cloud relevant Bill of Materials (BOM) Standards | R3 |
| CS10  M7  **COSP** |
| CS11  M8-10 | **Open Source Applications Case Studies**   * Architecture of Open Source Applications * Performance of Open Source Applications * Illustrative examples such as Linux, Eclipse, Moodle Project | W3, W4 |
| CS12  M8  RUOSP | **Risks of Using Open Source Software**   * Licensing Compliance * Support and Enhancements * Security Vulnerabilities * Malware Risk * Open Source Security Scores (OpenSSF) | R3 |
| CS13 | **Open Standards**   * What are Standards * How are Standards developed * What are Open Standards * Open Internet Standards IETF, IRTF, IAB * Open Standards Collaboration versus Open Source Collaboration * Software Standards, Security Standards, Benchmark Standards | W6 |
| CS14  M9  OS |
| CS15 | **Open Access to Knowledge and Creativity**   * Global Movement of Knowledge Access * Wikipedia, KhanAcademy, Met * Open Artwork (Images, Music, Documents) * Creative Commons (CC) Licensing * Variants of CC * Attribution of CC works | W7 |
| CS16  M10  OAKC |

**Detailed Plan for Experiential Learning Components**

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| **Lab No** | **Lab Objective** | **Lab Sheet Access**  **URL** | **Content Reference** |
| 1. | Working with Git  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: Git |  |  |
| 2 | Open Source Project Metrics  The aim of this lab sheet is to guide the student to understand different metrics involved measuring success of Open Source Projects.  Technologies used : Git, GitHub |  | https://open source.gui de/metrics/ |
| 3. | Generate SBOM for Open Source project  The aim of this lab sheet is to guide the student to understand how to generate Software Bill of Materials for Open Source Projects  Technologies used: SPDX / CylconeDX |  | https://spdx .dev/ |
| 4. | Generate Security Score for Open Source Project  The aim of this lab sheet is to guide the students to understand risks in using open source software and how to generate a security score  Technologies used: OpenSSF |  | https://open ssf.org/ |

**Evaluation Components**

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| **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 |
| Class Assessment |  |  | 5% |  |
| Assignment I /  Project – Phase I | Online / Open  Book |  | 5% | Pre-mid sem |
| Assignment-II /  Project – Phase II | Online / Open  Book |  | 10% | Post-mid sem |
| EC-2 | Mid-Semester Exam | Open Book | 2 Hours | 30% |  |
| EC-3 | Comprehensive Exam | Open Book | 3 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.