

## M.Tech. in Software Engineering

### University-Style Syllabus (2 Years / 4 Semesters)

**Programmer Duration:** 2 Years (4 Semesters)

**Programmer Level:** Postgraduate (M.Tech.)

**Credits:** 68–80 (Typical AICTE/NEP Pattern)

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#### Semester I

| Subject Code | Subject                                 | L | T | P | Credits |
|--------------|-----------------------------------------|---|---|---|---------|
| MSE101       | Advanced Software Engineering           | 3 | 1 | 0 | 4       |
| MSE102       | Software Project Management             | 3 | 1 | 0 | 4       |
| MSE103       | Advanced Data Structures and Algorithms | 3 | 0 | 2 | 4       |
| MSE104       | Research Methodology                    | 2 | 0 | 2 | 3       |
| MSE105       | Software Engineering Laboratory         | 0 | 0 | 4 | 2       |
| MSE106       | Seminar – I                             | 0 | 0 | 2 | 1       |

**Total Credits:** 18

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#### Semester II

| Subject Code | Subject                                | L | T | P | Credits |
|--------------|----------------------------------------|---|---|---|---------|
| MSE201       | Software Testing and Quality Assurance | 3 | 1 | 0 | 4       |
| MSE202       | Agile Software Development             | 3 | 0 | 2 | 4       |
| MSE203       | Cloud Computing and Dev Ops            | 3 | 0 | 2 | 4       |

| Subject Code | Subject                                   | L | T | P | Credits |
|--------------|-------------------------------------------|---|---|---|---------|
| MSE204       | Software Architecture and Design Patterns | 3 | 0 | 2 | 4       |
| MSE205       | Advanced Software Development Laboratory  | 0 | 0 | 4 | 2       |
| MSE206       | Seminar – II                              | 0 | 0 | 2 | 1       |

**Total Credits: 19**

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### Semester III

| Subject Code | Subject                                          | L | T | P  | Credits |
|--------------|--------------------------------------------------|---|---|----|---------|
| MSE301       | Artificial Intelligence for Software Engineering | 3 | 1 | 0  | 4       |
| MSE302       | Software Metrics and Process Improvement         | 3 | 0 | 2  | 4       |
| MSE303       | Secure Software Engineering                      | 3 | 0 | 2  | 4       |
| MSE304       | Elective – I                                     | 3 | 0 | 0  | 3       |
| MSE305       | Dissertation Phase – I                           | 0 | 0 | 12 | 8       |

### Elective – I (Choose One)

- MSE311 – Mobile Application Development
- MSE312 – Big Data Analytics
- MSE313 – Machine Learning
- MSE314 – Blockchain Technologies
- MSE315 – Internet of Things

**Total Credits: 23**

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### Semester IV

| Subject Code | Subject | L | T | P | Credits |
|--------------|---------|---|---|---|---------|
|--------------|---------|---|---|---|---------|

| Subject Code | Subject                 | L | T | P  | Credits |
|--------------|-------------------------|---|---|----|---------|
| MSE401       | Dissertation Phase – II | 0 | 0 | 24 | 16      |
| MSE402       | Viva Voce               | 0 | 0 | 2  | 2       |
| MSE403       | Industrial Internship   | 0 | 0 | 8  | 4       |

**Total Credits: 22**

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### Laboratory Courses

| Code   | Laboratory                               |
|--------|------------------------------------------|
| MSE105 | Software Engineering Laboratory          |
| MSE205 | Advanced Software Development Laboratory |
| MSE305 | Research and Dissertation Work           |
| MSE401 | Dissertation and Project Implementation  |

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### Detailed Unit-Wise Syllabus

#### MSE101 – Advanced Software Engineering

##### Unit I

- Software Process Models
- Software Development Life Cycle (SDLC)
- Software Engineering Principles

##### Unit II

- Requirements Engineering
- Software Requirement Specification (SRS)
- Requirements Validation

##### Unit III

- Software Design Concepts
- UML Modeling
- Object-Oriented Design

#### **Unit IV**

- Software Maintenance
- Software Re-engineering
- Software Configuration Management

#### **Unit V**

- Emerging Trends in Software Engineering
- AI-Assisted Software Development
- CASE Tools

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### **MSE201 – Software Testing and Quality Assurance**

#### **Unit I**

- Fundamentals of Software Testing
- Testing Strategies

#### **Unit II**

- White Box and Black Box Testing
- Integration Testing

#### **Unit III**

- Automated Testing Tools
- Performance Testing

#### **Unit IV**

- Software Quality Models
- ISO and CMMI Standards

#### **Unit V**

- Quality Assurance Practices
  - Continuous Testing
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## MSE203 – Cloud Computing and Dev Ops

- Cloud Architecture
  - Virtualization
  - Docker and Cabernets
  - CI/CD Pipelines
  - Infrastructure as Code
  - Monitoring and Logging
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## MSE303 – Secure Software Engineering

- Secure SDLC
  - Secure Coding Practices
  - Application Security
  - Threat Modeling
  - Security Testing
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## Practical List

Students should perform practical exercises such as:

- UML Modeling
  - SRS Documentation
  - Software Project Planning
  - Agile Sprint Planning
  - Git and GitHub Version Control
  - Jenkins CI/CD Pipeline
  - Docker Containerization
  - Cabernets Deployment
  - Unit Testing with JUnit
  - Selenium Automation Testing
  - Sonar Cube Code Quality Analysis
  - Secure Coding Practices
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## Examination Scheme

Component

Marks

| Component                | Marks |
|--------------------------|-------|
| End Semester Examination | 70    |
| Internal Assessment      | 30    |
| Practical Examination    | 100   |
| Seminar                  | 100   |
| Dissertation             | 300   |
| Viva Voce                | 100   |

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## Recommended Reference Books

- Software Engineering
- Software Engineering: A Practitioner's Approach
- Clean Code
- Design Patterns: Elements of Reusable Object-Oriented Software
- Continuous Delivery

## Programme Outcomes

Upon successful completion of the programme, graduates will be able to:

1. Design and develop high-quality software systems.
2. Apply advanced software engineering methodologies and best practices.
3. Manage software projects using Agile and DevOps approaches.
4. Develop secure, scalable, and maintainable software solutions.
5. Conduct software testing and quality assurance effectively.
6. Perform research and innovation in software engineering.
7. Lead software development teams in industry and academia.
8. Pursue doctoral studies or advanced research in software engineering.