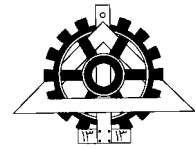




IN THE NAME OF GOD

Dept. of Civil Engineering  
University of Tehran



# “Meshless Methods (EFM)”

**A 3-Unit PhD Course in Computational Mechanics**

[http://sfsepehr.i8.com/Sohail/courses.htm#\\_meshless](http://sfsepehr.i8.com/Sohail/courses.htm#_meshless)

*lectured by:*

**S. Mohammadi  
S. Forouzan-sepehr**

**Evaluation:**

- ❖ Homework ~30%
- ❖ Final Exam, Part I: Questions (Closed Book) ~10%
- ❖ Final Exam, Part II: Problems (Take Home) ~ 60%

**Contents in Brief:**

- ❖ Introduction
- ❖ Preparation to Solve Engineering Problems by the Use of Meshless Methods
- ❖ Integration Methods
- ❖ Development of Meshless Methods
- ❖ Element-Free Galerkin Method
- ❖ Meshless Local Petrov-Galerkin Method
- ❖ Reproducing Kernel Particle Method
- ❖ *hp*-Cloud Meshless Method
- ❖ Advanced Topics

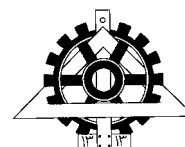
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Further details about the course are available at: [<http://sfsepehr.i8.com/Sohail/courses.htm#\\_meshless>](http://sfsepehr.i8.com/Sohail/courses.htm#_meshless)



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## “Meshless Methods (EFM)”

S. Mohammadi, S. Forouzan-sepehr

**A 3-Unit PhD Course in Computational Mechanics**

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### Contents:

#### 1. Introduction

Outline of the course, a review on general partial differential equations for engineering problems, an overview to computational methods for solving boundary value engineering problems, the idea of meshless methods.

#### 2. Preparation to Solve Engineering Problems by the Use of Meshless Methods

Modelling of the geometry, node generation, definition of influence domain, a review on principles for weak forms, definition of weight function, meshless methods general procedure, comparison between EFM and FEM.

#### 3. Integration Methods

Background cells and Gauss points, nodal integration.

#### 4. Development of Meshless Methods

Point interpolation & approximation methods, “Smoothed Particle Hydrodynamic Approach (SPH)”, “Finite Point Method (FPM)”, “Finite Volume Method (FVM)”, “Moving Least Squares Approximation (MLS)”, “Partition of Unity Approach (PUM)”, “Reproducing Kernel Particle Method (RKPM)”.

#### 5. Element-Free Galerkin Method (EFGM)

EFG shape function construction, application of EFGM in heat transfer problems, application of EFGM in solid mechanics, nonlinear problems.

#### 6. Meshless Local Petrov-Galerkin Method (MLPG)

MLPG formulation, application of MLPG in dynamic problems.

#### 7. Reproducing Kernel Particle Method (RKPM)

RKPM formulation, application of RKPM in computational contact mechanics.

#### 8. hp-Cloud Meshless Method

An overview to adaptive analysis, *hp*-Cloud formulation, application of *hp*-Cloud in computational fracture mechanics.

#### 9. Advanced Topics

Error estimation in meshless methods, node refinement and renoding, adaptive procedures for meshless methods, coupled methods (EF-FE, EF-BE and EF-BE-FE).

### Evaluation:

1. Homework ~30%
2. Final Exam, Part I: Questions (Closed Book) ~10%
3. Final Exam, Part II: Problems (Take Home) ~ 60%

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### **Proposed by:**

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